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# TREATISE

ON THE

## DISEASES OF THE MOUTH;

COMPRISING

THE STRUCTURE AND FUNCTIONS OF THE MOUTH,

THE HISTORY OF ITS DISEASES,

THE MEANS OF PRESERVING IT IN BEAUTY AND HEALTH,

AND OPERATIONS

APPERTAINING TO THE DENTAL ART.

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BY J. B. GARIOT,

DENTIST TO THE KING OF SPAIN ; MEMBER OF THE ROYAL COLLEGE OF SURGERY AT MADRID ;  
ASSOCIATE MEMBER OF THE SOCIETY OF MEDICINE, AT PARIS, ETC.

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TRANSLATED FROM THE FRENCH,

BY J. B. SAVIER, D. D. S.

For the American Library of Dental Science, with Notes by the Editors.

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PUBLISHED BY THE AMERICAN SOCIETY OF DENTAL SURGEONS.

WOODS AND CRANE, PRINTERS.

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1843.

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THE STRUCTURE AND FUNCTIONS OF THE MOUTH

THE NATURE OF ITS DISEASES

THE NATURE OF THE DISEASES IT IS CAUSED BY AND WHICH

IT CAUSES TO THE MOUTH

BY J. C. GARRISON

NEW YORK: G. P. PUTNAM'S SONS

1871

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TREATISE

DISEASES OF THE MOUTH

TO THE

AMERICAN SOCIETY OF DENTAL SURGEONS,

FOR THE

NOBLE AND PHILANTHROPIC WORK IN WHICH ITS MEMBERS ARE

ENGAGED FOR THE ELEVATION OF THEIR PROFESSION,

AND THE

PROTECTION OF THE PUBLIC AGAINST DENTAL EMPIRICISM,

THIS WORK IS RESPECTFULLY DEDICATED,

BY THE

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TO THE

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THE

AT THE

TRANSITION



# TREATISE

ON

## THE DISEASES OF THE MOUTH.

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### PART FIRST.

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#### STRUCTURE OF THE MOUTH.

THE mouth is truly the most important part of the countenance, and the most remarkable in its structure; it is the mouth and eyes that give to the physiognomy nearly all its expression. It is from the structure and form of the lips especially, that the famous Lavater infers the disposition of his characters; by long observation he acquired the art of divining the moral sentiments not merely from the features of the various parts of the human face, but also from the attitudes of the whole body under the various circumstances of life. This art would at first appear merely imaginary, yet we can perceive reality in it, for our physical faculties develop themselves in consonance with our moral affections; this is a necessary result, and a coincidence more or less remarkable may ever be looked for. It is indeed curious to observe to what a degree violent passions may change the aspect of the most beautiful countenance; while soft and kind feelings and manners modify the most repugnant features, and impart to them an amiable and winning expression.

Of the various parts of the face there are none that have occasion to move so frequently as the lips: these do not merely move with the other features of the face to express the various passions and emotions, but they are exercised in speaking, singing and in mastication, and it is also known what part they take in the pleasures of caressing. The habit of moving with facility is acquired from these causes, and the lips become of the whole countenance that part mostly under the control of the will. Persons who have handsome teeth therefore, soon acquire the art of exhibiting them, while those whose teeth are bad with the same facility conceal them.

To understand well the several diseases to which the various parts of the mouth are liable, and to appreciate the influence of hygienic and medicinal agents proper to prevent or to remedy such diseases, and the operations that may be necessary, we should become acquainted with the structure of the organs that enter into the formation of the mouth. The apparatus of mastication is composed of bones, vessels, nerves and glands: interiorly the mouth is lined also with a mucous membrane which is continuous with the skin upon the lips.

## SECTION I.

### *Osseous Apparatus.*

THE bones that enter into the formation of the superior part of the mouth are the two maxillary bones and the two palate bones; inferiorly is the inferior maxillary bone or the inferior jaw. The maxillæ contain thirty-two teeth, to wit. eight incisores, four cuspidati, eight bicuspides and twelve molares.

In the general formation of the mouth the prominence of the maxillary bones is remarkable. In mammiferous animals it is observed that the elongation of the jaws correspond to the flatness of the forehead, and is in an inverse proportion to the size of the cranium: thus it appears that when the face is elongated by the maxillary bones it is at the expense of the cranium, which is then narrow, flat, and can only contain a small quantity of cerebral substance.

If we remember that the capacity of the brain and the minuteness of the nervous expansion are indicative of the degree of intelligence, it will be understood why we may judge of the intellectual faculties also from the extent of the maxilla. It is probably from this consideration that in vulgar parlance an ignorant silly man is said to have "*too much jaw.*"

From the foregoing remarks it will be perceived that the degree of intelligence may in some manner be measured by the facial angle. To ascertain this angle Camper draws a line above the plane of the base of the cranium, which he supposes to pass over the auditory foramini and over the floor of the nostrils, and which inclines upon the most prominent part of the forehead.

Hence it will be perceived that this angle is from 80 to 85 degrees on the head of an European, from 75 to 80 on the head of the Mongolite, from 70 to 75 on the head of the negro, and from 60 to 65 on the head of the monkey.

This angle diminishes in a very remarkable manner on the head of the wild monkey, and on those of other carnivorous and herbivorous animals.

It is observed that in the Greek statues the facial angle is always larger than we behold it in nature, thus imparting grace and majesty to the personation: that of Pythian Apollo is more than 90 degrees. In the different classes of mammiferous animals the superior jaw, which occupies more space, relatively, than in man, is developed by four points of ossification; these points produce four bones; one on each side receives the name of submaxillary; the reunion of the other two in the middle, forms the intermaxillary bones, in which are implanted the incisores.

This disposition is noticed in all animals up to the ourang-outang inclusively; but in man the superior jaw is developed by two points of ossification, which produce the submaxillary bones. Thus is found in the development and structure of the superior jaw, a peculiar characteristic of the human species, which establishes, in comparative anatomy, an important fact upon which we cannot too minutely dwell.

### *The Superior Maxillary Bone.*

In man the maxillary bones form the greater part of the superior jaw. Situated by the side of each other, they occupy the smallest and anterior part of the face; they have their apophyses superiorly and anteriorly, and their alveolar arch inferiorly and anteriorly.

To facilitate the description of these irregular bones, we divide their surface into two faces, internal and external.

Upon the external face is seen, in front and near its middle, a large foramen, which, together with that on the opposite side, forms the anterior opening of the nasal fossa. Above this opening is the apophysis of the maxillary bone, flat upon its sides; this apophysis, exteriorly, is rough, and gives attachment to the *levator labii superioris alaeque nasi*, and within two crests situated one above another: the superior articulates with the superior turbinated bone, and the inferior with the inferior turbinated bone. The anterior border of this apophysis presents inequalities which correspond to those of the posterior border of the bone of the nose with which it articulates. Its posterior border, which gives attachment, exteriorly, to the orbicularis muscle, presents a part of a gutter, which the *os unguis* completes, and to which it is attached. Its summit is rough to be united with the *os planum* of the ethmoid bone.

Below the opening of the nasal fossæ is a slight depression into which the *lavator labii* is inserted. At the side of this is another depression, somewhat deeper, called the canine fossa. In the middle of this fossa are some little inequalities indicating the attachment of the canine muscle; above this is the suborbital foramen, through which pass vessels and nerves of the same



name; above this again are rough ridges in which is implanted the levator labii superioris. This fossa is limited in front by inequalities which give attachment to the dilator of the nose, and posteriorly it terminates near the large foramen below where is found the malar eminence. This eminence is very prominent and presents a triangular and rough projection which is united to the zygoma. In prosecuting the examination of the external surface of the maxillary bone, we find posteriorly the maxillary tuberosity. Near the middle of this tuberosity is observed some holes or foramina which give passage to vessels that nourish the maxillary bone, and the commencement of the superior and posterior conduits which give passage to vessels and nerves of the same name. This tuberosity inferiorly presents inequalities to which the buccinator is attached and posteriorly are facets upon which the palatine bone articulates. Behind the apophysis, and above the parts that we have described, the maxillary bone contains a large depression of a somewhat triangular form which corresponds to the base of the orbit. This orbitary floor presents posteriorly a little fissure which is the commencement of the sub-orbital canal: in front and on this floor are small ridges to which is attached the oblique muscle of the eye. Its internal border is irregular, and articulates anteriorly with the os unguis, a little farther back with the os ethmoides, and posteriorly with the palate bone.

Upon the external face of the maxillary bone is seen the dental arch which reaches all along its inferior border. This alveolar border, which is convex throughout its whole extent, has projections and depressions which correspond to the alveoli and their transverse parietes. These parietes are thicker at the posterior part of the maxillary bone, where the large molares are situated, than at the anterior part which receives the small molares or bicuspides.

The alveoli are of the form of the teeth that they contain. This form will be described in detail when we shall speak of the teeth. We would here remark however, that the first five of these alveoli are generally single, although the fourth and fifth present a bifurcation at the bottom; the alveoli of the last three have from two to five cavities each. These cavities are sometimes very divergent, and in some subjects, after having diverged, approximate; in this case the roots that they receive cause the teeth to be called *barred teeth*.

The membrane that lines the interior of the alveoli adheres very strongly to the roots of the teeth. A fillet of nerves and vessels passes through a foramen at the bottom of each alveolus, and reaches the pulpos substance of the tooth.

The internal face of the maxillary bone is irregularly concave. It presents from before backwards and along its middle a



prominence called the *palatine apophysis* because it forms a great part of the roof of this name.

The superior face of this apophysis is concave; it forms the greater part of the floor of the nasal fossæ, and is covered with the pituitary membrane. At its anterior and internal part is seen the superior orifice of the anterior palatine canal. This canal is directed downward and forward through the thickness of the palatine apophysis; in its course it unites with the foramen on the opposite side and forms a single conduit which opens upon the interior face of this apophysis. This face is regularly concave and forms a great part of the palatine arch and depressions which receive the glands of this name. Upon its external side is a furrow in which is lodged the posterior palatine vessels and nerves: of the four borders that surround this face, the anterior is the thickest, the posterior is the thinnest, and is furnished with a little eminence upon its superior surface to articulate with the palate bone; its internal border which has a thick and rough surface, is united to its fellow. But the reunion of the two maxillary bones, at this point, is not perfect, superiorly; there is at this part a furrow which receives anteriorly the cartilage of the septum of the nose, and posteriorly, the vomer. The external border unites the palatine apophysis to the remainder of the bone.

Above this apophysis, the internal face presents nothing remarkable; very high up is seen a large opening, which is the maxillary sinus. This sinus is bounded above by the orbit, and below by the alveoli of the posterior teeth; this is important to be known in performing operations upon the sinus. The maxillary sinus does not exist in the foetal subject, but commences to be developed in childhood, and continues to increase with age. Its opening viewed upon the maxillary bone alone, is large, dry and isolated; but in the natural state, it is formed partly by the *os unguis* anteriorly, the palatine bone posteriorly, the ethmoid bone superiorly, and the inferior turbinated bone inferiorly; the circumference of this opening is very much diminished by the membrane that lines the sinus. The lining membrane, at the entrance of the sinus is folded back, in such a manner, as to leave an opening only of a line or a line and a half in diameter.

### *The Palate Bones.*

The palate bones are of an irregular figure, and situated by the side of each other, at the posterior part of the nasal fossæ and of the palatine arch. They are formed of two flat pieces one horizontal, the other vertical, and joined to each other, forming a right angle.

In order to find the respective position of one of these bones, its horizontal part must be placed below and within, and the thinnest

part of its vertical portion directly in front. The description of the various parts of the palate bone will be facilitated by examining successively, its internal and external faces, and, its four borders, one of which is situated internally, one posteriorly, one superiorly and one inferiorly.

The internal face of this bone is concave. Its horizontal portion enters into the formation of the floor of the nasal fossæ, and its vertical part contributes to the formation of the external wall of the same fossæ. Upon the superior and interior vertical part, is seen a horizontal crest which terminates opposite the sphenopalatine foramen, and articulates with the superior turbinated bone, below the crest is a little gutter, which constitutes the posterior part of the superior duct, and below this is a depression which terminates the lesser duct. Below the parts that we have just named is another horizontal crest, and is larger than the preceding one, it articulates with the inferior turbinated bone, and presents inferiorly a considerable depression that forms the remote part of the inferior duct.

The external face is slightly convexed and irregular. Its horizontal portion forms the palatine roof; it is rough posteriorly, where the palatine membrane is attached. It has exteriorly a crest for the attachment of the *peristaphilius extenuus*.

The vertical portion of the external face of the palate bone, closes the maxillary sinus posteriorly which adheres to the posterior and interior part of this bone.

The anterior border presents, upon its horizontal part, irregularities for its articulation with the palatine apophysis of the submaxillary bone; this border is very thin at its vertical part, and it is adapted to a fissure which is seen upon the inferior part of the maxillary sinus.

The posterior border is slightly concave and sharp at its horizontal part, where it gives attachment to the soft palate. Externally is seen a large eminence which is called the tuberosity or pyramidal portion of the palate bone. This tuberosity has, superiorly, three fissures; the middle fissure is smooth and terminates the pterygoid fossa; the two lateral wings receive the wings of the pterygoid apophysis; the internal one is deeper and more uneven. The tuberosity contains anteriorly, the orifice of the posterior palatine canal; posterior to this canal is the orifice of the accessory canals. The external part has a smooth surface which corresponds to the zygomatic fossa, and is rough anteriorly where it articulates with the posterior and inferior border of the maxillary tuberosity.

The vertical portion of the posterior border articulates, at its superior part, with the pterygoid apophysis.

The superior border has two very prominent eminences, separated by a fissure which forms a large portion of the sphen-

palatine foramen. The anterior eminence is larger and generally presents five facets, three of which are articular. The anterior or submaxillary facet articulates with the submaxillary bone; the posterior is irregular and called the sphenoidal facet, because it is connected to the sphenoid bone; the internal is concave and called the ethmoidal, from its connection to the ethmoid bone.

Two of these articular facets can be always distinguished from the others, inasmuch as they are smoother; one of these is called the orbital, from its entering into the formation of the orbital cavity and the other the zygomatic, as it forms a part of the zygomatic fossa.

The posterior eminence is smaller than the anterior and has three facets; the superior articulates with the sphenoid bone, and has a fissure which completes the pterygo-palatine fissure; the internal corresponds to the nasal, and the external to the zygomatic fossa.

The inferior border, which has an inward direction, is thick, rough, and articulates with its fellow on the opposite side; it has superiorly a crest which projects outwardly. There is a similar crest on the opposite side which constitutes the groove that receives the inferior border of the vomer.

The palate bones articulate with the submaxillary, the sphenoid, the ethmoid, the inferior turbinated bones and the vomer. Their development is not yet well understood; some suppose that they are developed by one point of ossification, while others imagine that they commence in four points.

### *The Inferior Maxillary Bone.*

The inferior jaw is formed of a single bone, called the maxilla. This singular bone forms the base of the face. In its natural position, its convex part is in front, and its alveolar border superiorly and upon a horizontal plane.

The maxilla is flattened from before backwards, and forms a paraboloid arch in that direction. The extremities of this bone which are called its branches, are directed upward, forming an angle with the body of the bone. The general configuration of the maxilla admits of its being divided into an external and an internal face, a superior or alveolar border and an inferior border.

The external face is convex, especially in front, and has at its lesser part a vertical line, which indicates the union of the two pieces of which this bone was primitively formed; this line is called the symphysis of the chin and becomes obliterated with age. The inferior part forms an irregular triangular eminence, called the chin; this gives attachment to the muscles of the chin. On each side of this eminence is the external maxillary line that runs obliquely upward and backward, and is continuous with the external



edge of the anterior border of the coronoid apophysis; along this line the platysma myoides, the triangulares and the depressors are attached. Near the symphysis and above the maxillary line are two depressions in which the depressors of the lower lip are inserted.

At these depressions there are two gutters that continue along the external maxillary lines, and present near the second bicuspid, the external orifice of the maxillary canal, or mental foramen, which gives exit to the maxillary nerves and blood-vessels. Posterior to the mental foramen, is seen a quadrilateral surface which marks the situation of the masseter muscle.

The internal face of the jaw is concave, and presents at its centre, the internal side of the symphysis of the chin. The superior part of the symphysis adheres to the frænum of the tongue, and the inferior part terminates in a slight eminence called geni, which gives attachment to the genio-glossus and genio-hyoideus muscles. On each side of this commences the internal maxillary lines, called the myloideus lines, which have, like those on the external face, an oblique direction, extending as far as the edge of the coronoid apophysis. To the anterior parts of these lines are attached the mylo-hyoideus, and to the posterior, the mylo-pharyngeus. Below and upon the sides of these lines is observed a depression for the reception of the digastric muscle. Near this fossa is a gutter which receives at its anterior, the sublingual gland, and, at its posterior part, the submaxillary in a kind of oblong depression. There is, at the posterior part of the maxilla, a rough and flat space for the insertion of the pterygoideus internus. At the upper part of this roughness is seen the maxillary foramen, through which enters a nerve, artery and vein; these pass along the bone under the alveoli, giving off branches to each tooth. When this canal reaches the socket of the cuspidatus it divides as do also the nerve and vessels that pass through it; one division of these passes along the anterior part of the bone, and gives off rami to the cuspidati and incisores; the other retrogrades and then passes out of the mental foramen, and are then called the mental nerve, artery and vein. At the edge of the maxillary foramen is a spine of bone, into which is inserted the ligament of the jaw.

The superior or alveolar border is narrower than the inferior, and presents, in front, the inferior dental arch which has a horizontal position; but posteriorly, the alveolar border becomes more reduced, and assumes a vertical direction as the subject advances in age. The alveolar border contains sixteen sockets, eight upon each side of the jaw. They are distinguished by the names of the teeth that they contain, or by their numerical number, commencing with the anterior one. The transverse processes



of the sockets form interiorly, but more especially exteriorly, alternate depressions and prominences. The sockets of the inferior are smaller than those of the superior jaw, and each is of the form of the tooth which it contains; thus, those into which the incisores are implanted are single and somewhat flattened, while the rest are round, the sockets of the incisores and cuspidati are generally single; those of the bicuspidates are sometimes divided by a partition. Finally, the sockets of the molares are divided into two, three, four and five cavities each containing a foramen through which passes a branch of the dental nerve, artery and vein. The sockets are lined with a membrane which adheres very strongly to them and also to the teeth they contain. In inflammation of these parts in the administration of mercury and in scorbutic affections, this membrane becomes so thick as to loosen the teeth and sometimes even cause them to drop out.

The vertical portion of the superior dental border is formed by the coronoid apophysis. On each side of this border, is a prominent ridge and also a groove which descends along the alveolar border.

The inferior border is thicker in the middle than at the sides. The part of this border that belongs to the body of the jaw presents a horizontal direction, while that which appertains to the branches assumes a vertical direction, and is situated posteriorly. The first gives attachment to some of the fibres of the platysma myoides; to the outer portion of the second, the masseter, to the inner portion the pterygoideus, and in the middle or upon the crest of this border the stylo-maxillary ligaments are attached.

It should be borne in mind, that the angle formed by the border at this point becomes more acute, as the subjects advance in years; this arrangement causes luxation of the jaws of old persons to be very easy; whereas this accident is almost impossible in children. The rest of this border is enlarged superiorly, and presents a depression that receives the parotid gland.

The extremities of the maxilla are directed upward and backward, and have two apophyses, one anteriorly called the *coronoid*, and one posteriorly called the *condoloid*.

The coronoid apophysis is flat, large at its base, and terminates in a point which is embraced by the temporal muscle. Its posterior part is adapted to the sigmoid groove which contains the masseter nerve. The condoloid apophysis is supported by a short neck; is flatter from before backward, and contains at its anterior portion a slight depression for the insertion of the pterygoideus internus. The summit of the condyle is round, smooth, and covered with a cartilage. It articulates with the glenoid cavity of the temporal bone and its transverse apophysis, both of which are likewise furnished with a cartilaginous covering.

In the articular cavity is an intermediate cartilage, concave upon both surfaces, consequently much thinner in the middle than at its circumference. This cartilage rests upon the maxilla and follows the motion of this bone.

The fibrous membrane which forms a capsule around the articulation is attached, by its superior border, to the transverse temporal apophysis anteriorly, and in front of the glenoid cavity posteriorly; its inferior border adheres to the neck of the condyle which it surrounds. This membrane descends lower at its posterior than at its anterior part, or at its sides; its tissue is thin, flexible and thickest at its sides. It should be observed that it is attached around the inter-articular cartilage, so that there are two articular cavities, one above and the other below the cartilage. These cavities are lined with two synovial capsules, which adhere closer at the part that corresponds to the cartilages, than upon the fibrous membrane. The synovia which constantly lubricates the interior of these cavities is secreted by the synovial capsules.

The articular capsules are not the sole means by which the jaw is retained in its position; there are two lateral ligaments and muscles that serve the same purpose.

The internal lateral ligament is attached above to the spinous process of the sphenoid bone, and to the internal side of the glenoid fissure; below it is inserted into the crust near the internal orifice of the maxillary foramen.

Some anatomists mention a second internal lateral ligament; but it cannot be distinguished from the fibrous capsule, the fibres of which it is formed.

The ligaments which we have just described are in a state of tension, when the condyles of the jaw are carried backward, and are relaxed when the condyles are brought forward.

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## SECTION II.

### *Dental Apparatus.*

THE history of the teeth should be studied with diligence and described with minuteness by dental writers, for we should regard with indifference nothing that appertains to the parts upon which we are in the daily habit of operating, in order to favor their development, to preserve them in a healthy condition, to arrest, or prevent disease and to be able to replace them when lost.

Few authors have made the instruments of mastication their special study. We cannot obtain from dental works that information upon this subject which may be derived from any of the anatomical works. No person, however, is more concerned than those who devote themselves to this particular branch; it is there-

fore in treatises upon the teeth that we should be able to find all that is known relative to these organs. Before commencing the description of the human teeth, we shall rapidly review the conformation of these organs in the various classes of vertebral animals. This will necessarily throw great light upon the different phenomena that the teeth present, during the various periods of their growth. The influence that a knowledge of comparative, has upon the study of human anatomy, is at present, too generally admitted to require comment.

Naturalists have examined the teeth with the greatest care, for they furnish essential characteristics in the classification of mammiferous animals.

To furnish a brief review of the conformation of the teeth of various animals provided with these organs, we think, that we could not do better, than to levy upon such medical works in which a description of the apparatus of the functions in man are preceded by the description of the same apparatus in other animals, a course highly calculated to shed light and interest upon anatomy, by facilitating the study of this science and more especially by showing the relations and uses of the different parts that enter into the formation of organs.

“Fishes, reptiles and mammiferous animals, are provided with teeth which are either implanted in the maxilla, or merely retained in their situations by the gums.

“The jaws, the palate, the throat, the bones to which the tongue and gills are attached and even the tongue itself in fishes are provided with teeth. Although this arrangement may be favourable for mastication, yet it is not so in regard to taste. Teeth of animals that assume various forms, are supported by an osseous tubercle which is covered by a membrane; when this membrane is destroyed, the teeth and tubercles drop out and are replaced by others.

“The teeth of mammiferous animals are divided into three classes. Those in front are called the incisores; this name has always been given by naturalists to those teeth which are implanted in the inter-maxillary bone. Those of the second class are cut upon several sides, are situated at the angles of the lips and are called angulares. Those of the third class are called molares; these are large and situated posteriorly and upon the sides of the mouth.

“The teeth of some animals are so long, and of such an unseemly form, that they do not merit this appellation; such are the tusks of the narwhale, the elephant, the hippopotamus, the wild-boar and the teeth of the *barbyrouessa*.

“The molares exist in the jaws of all animals that have teeth; but the incisores are absent in some; thus the *édentés*\* are only

\* A class of mammiferous animals which have only the molares.



provided with the molar teeth; the sloth are deprived of the incisores, the *rongeurs*\* of the angulares. The ruminating animals have incisores only in the inferior jaw. The three classes of teeth that we have already named are observed in the solipede, several of the *pachidermes*,† carnivorous animals, quadrumans, and in man.

"Several animals have only a part of their jaws furnished with teeth; this is the case with the polypede, and that part of the jaws of the horse where the bit is placed.

"The incisores of the hare, the fox, and often those of children are indented. The indentations upon the incisores of the bat, are so deep that they resemble the teeth of a comb. The incisores of the *rongeurs* are long and curved. The angulares of the *tartia* are shorter than their other teeth. In man and monkeys they are all of equal height. The angulares of most monkeys are observed to be somewhat longer than their other teeth; those of the large carnivorous animals are remarkably long.

"The grinding surfaces of the molares are figured in various ways; those of carnivorous animals are furnished with one or more rows of tubercles; those of the *pachidermes* are tuberculous and those of herbivorous animals have prominent lines. These lines in ruminating animals form several crescents and in solipede, double festoons.

"The teeth of carnivorous and quadruman animals, and of man, are formed of a bony substance; their crowns are covered with enamel. The teeth of ruminating animals are composed of an osseous substance enveloped in a membranous follicle which primitively contained the tooth; their crowns are covered with a layer of enamel of a yellow color, the membranous follicle ossifies and forms a cortical envelope around the teeth.

"The teeth of the young elephant and hippopotamus are composed of vertical lamæ situated upon each other, and can, if the animal is young, be separated. The osseous lamæ, unequal in length, are afterward united by means of an enamel fluid that overflows them, thus forming a consolidated body composed of enamel and osseous lamæ.

"The osseous surfaces, by mastication, are promptly worn away, and, at the expiration of some years, the surface of the tooth becomes covered with prominent, irregular, enamelled lines, which, like the rough surface of a mill stone, is well adapted to grind food.

"That part of a tooth which is buried in the alveoli is called the *root*; the *crown* is that part which is seen above the gums, and the depression situated between the crown and root is the *neck* of the tooth.

"The roots of teeth are single or multiple. Teeth having

\* Animals of the rabbit kind.

† Mammiferous animals characterized by their thick skin.

single roots are at first very hollow; their cavity lined by a thin membrane upon which vessels and nerves ramify, is filled with a gelatinous substance, and becomes partly obstructed with age.

"The body is the first part of a tooth that is developed, it protrudes through the gums and commences to be worn away before the root is completely developed. When the development of the root is completed, the capacity of the alveolus diminishes and gradually fills up; the root is destroyed in proportion to the filling up of the socket, and the tooth, wearing away at each extremity, becomes very short in advanced age. It afterwards becomes loose in its socket, and finally drops out.

"The crowns of the teeth of solipede and ruminating animals are sometimes entirely worn down to the roots which separate when the tooth has more than one root. Denudation of the teeth of these animals pursues so regular and constant a course that the age of these animals can be accurately ascertained.

"A number of the teeth, in many animals, drop out and are replaced by others.

"Some fishes, as the shark, have their teeth enchased in the gums, and are shed four or five times; these teeth of replacement are concealed behind the others. Some reptiles present the same disposition, as is seen in the venomous dart of the viper.

"A portion of the denture of mammiferous animals drop out at a regular period, and those teeth that succeed these have their germs situated behind them. The teeth of the crocodile, which are conical and hollow, receive in their cavities those that are to succeed them.

"The roots of the deciduous teeth are destroyed very promptly; they become loosened in their alveoli, and are pushed out by the teeth of replacement. Second dentition serves also to ascertain the age of animals."

### *Description of the Teeth.*

There are in each of the jaws of the human species, four incisors, two cuspidati, four bicuspidates, and six molares. These organs are whiter and harder than other bones, and they differ from them in having their crowns covered with enamel.

### *Development of the Teeth.*

The alveolar border, in the fœtus, is entirely closed; but we can, at this period, discover, in the interior of the jaws, partitions which separate the alveoli. Each alveolus contains a bundle of little membranous follicles which is nearly of the same form as the tooth of which it is the germ. These follicles are enveloped in a fine membrane which resembles a serous membrane; it forms a closed sac, and its double folds surround the germ of the tooth.

This membrane lines the interior of the sockets to which it adheres very strongly, and when it comes in contact with the vessels and nerves that penetrate it, it separates from the alveolus and forms a sheath for them. It secretes an albuminous serum which lubricates the parts which it surrounds.

The pulps of the teeth commence to ossify upon the part near the alveolar border. As ossification progresses from the summit towards the root, we can gradually distinguish the form that each tooth will have when ossification is completed.

Ossific matter is deposited upon the teeth by the vessels that penetrate the dental cavities, in concentric layers, which as the subject advances in age, tend to obstruct these cavities; while the development of other hollow bones is effected by eccentric layers, and the cavities of these enlarge by the destruction of the inner walls.

The exact period of the formation of the membranous follicles has not yet been ascertained; but it is known that the first point of ossification is deposited between the fourth and fifth month of gestation. At birth the twenty teeth that constitute first dentition, are far advanced in their development, but are still concealed in the jaws. Their crowns, at this period, appear to be fully developed, and a part of their roots contains a conduit, the walls of which are very thin; they finally reach the bottom of the sockets. As the teeth continue to increase in all directions they press against the alveoli which presents but slight resistance. From the seventh to the fourteenth month, seldom earlier than the first period or later than the second, the temporary teeth commence to appear above the gums. It sometimes happens that one or more teeth are cut before birth, which was the case with Louis XIV.

At the usual period of dentition the dental cavities are very large, and the enamel at this time is of a cartilaginous consistency; but is developed more speedily than the osseous substance.

It has been pretended that the pressure of the gums upon the enamel of the teeth contracts its tissue, and gives it great solidity and a high polish. But generally the mechanical action of these parts upon each other modifies very little their development, which is occasioned by a vital action, and it is therefore not likely that the mechanical pressure of the gums can modify its structure.

It has also been supposed that the teeth during their eruption meet with considerable resistance from the gums; hence various means such as corals and incision of the gums have been adopted to diminish and prevent this obstacle; but all these are more or less useless. It is likely that scarcely any mechanical resistance exists. The eruption of the teeth is produced by the efforts of the economy, and in proportion to the health and vigorous constitution of the subject, is the facility with which this process is accom-



plished. When the child is weak and very nervous, dentition is laborious and occasions serious derangements; thus we witness symptoms of nervous affections characterised by vomiting, disease in the various parts of the gastric apparatus, such as an abundant salivation, loss of appetite, diarrhoea, &c. The diseases of dentition are so common among children who inhabit cities, that it is said that it destroys two in every hundred.

The evils produced by teething are generally very rare among animals; they are, however, observed in horses, and this is not astonishing when we recollect the great changes that take place in their jaws at this period.

The following is the order in which the teeth of first dentition appear; the two inferior central incisores are the first that are cut, about five days after these, the corresponding teeth of the superior jaw make their appearance, they however sometimes appear simultaneously. One or two months after the appearance of the centrals, the two inferior lateral incisores appear, and a short time after these the corresponding superior teeth. The eight temporary molares are the next which are cut, and finally, the four cuspidati the following year; so that in two years, seldom earlier, but often later, the child is provided with twenty teeth. The crowns of these teeth at first present slight reddish furrows, and the cutting edges of the incisores are frequently denticulated. About the sixth or seventh year of age the first molar appears through the gum. This tooth is not shed like those we have already named.

If, after death, we open the alveoli of the jaws of an infant, a short time before the epoch of second dentition, we will discover in the sockets of the deciduous teeth a fungous substance enclosed in a membrane. This substance is a new dental follicle, the vessels of which are very large, and give to the follicle a reddish appearance.

The follicles of second resemble those of first dentition. Their situation is generally behind the deciduous teeth; it is, however, not uncommon to see them above, or at the sides of these teeth.

The germs of the second denture soon become a point where an energetic action of the economy is called into requisition; the vessels of this part become enlarged, nutrition is active and the increase is rapid. On the other hand vessels that nourished the deciduous teeth become gradually obstructed; the roots of these teeth, no longer receiving any nourishment, are destroyed and being gradually forced from their sockets, by the crowns of the permanent teeth, they become loosened and finally drop out.

The teeth of second dentition commence to protrude through the gums about the sixth or seventh year, and follow the order of the deciduous teeth.

About the eighth or ninth year the second molar is cut, and the third molar or wisdom tooth from the twentieth to the thirtieth year, sometimes this tooth does not show itself until old age.

We have stated that the permanent teeth are never replaced by others when lost; there has been, however, some few examples to the contrary, thus Diemerboeck states, that in his fifty-sixth year he cut a cuspidatus, having a short time before lost one that occupied its place.

The whole number of teeth of the second denture are not always cut; in consequence of some of the germs never having existed or because they had been arrested in their development.

Several writers among whom are Pline, Valiere Maxime, Plutarch, Diemerboeck and others, have said that they have seen all the teeth of the jaw formed of a single piece, or united to one another. Sabatier and Desault have seen this disposition in the teeth of dead subjects; but it was owing to thick layers of tartar, the polish and color of which resembled the enamel so closely that they would have been deceived by it, had they not examined the teeth near their roots when they discovered that they were separate. The observations of these two celebrated surgeons induces us to think that those who have reported similar cases of this kind of osseous union of the teeth, have been deceived by similar circumstances. It is not uncommon to see two and even three teeth united at their roots, which can only be discovered after extraction.\*

Sometimes part of the teeth of second dentition are naturally inclined backward, this arrangement is often influenced by the presence of the deciduous teeth. Persons whose teeth are thus arranged, are said to have two rows of teeth: the deciduous teeth in such cases are always in front and are called snag teeth. (*sur dents*.)

Columbus relates a case of one of his children who had, in this way, three rows of teeth. Sometimes teeth present various aberrations in their development: thus Sabatier informs us that he saw two teeth implanted in the palatine apophysis, at the point of union with the horizontal portion of the palate bone. The prominence that these teeth produced in the mouth occasioned an incommodious pressure upon the tongue. Albinus accidentally discovered a tooth similarly situated; but it was concealed in the substance of the bone.

The last author relates a case of two very large teeth, situated in the mental apophysis; they were inverted and formed a prominence on the nose and upon the side of the cheek. Desault discovered a tooth buried crosswise in the substance of the alveoli. All of these irregularities caused little or no inconvenience.

\* The fact that the crowns of teeth, and sometimes the roots are united is now well established.—Eds.

*Shape of the Teeth.*

THE three classes of teeth are called, incisores, cuspidati, bicuspidés and molares.

The body of a tooth is that part of the organ which is above the alveoli, the root that which is implanted in the alveolar cavity, and the neck is the line that separates the root from the crown.

The teeth of adults are harder than those of children and of very aged persons. The three classes of teeth possess peculiar characteristics upon their crowns and roots, by which they can readily be distinguished from one another.

Thus, the incisores, which are eight in number, four in each jaw, are situated in the anterior part of the jaws. The interior are generally smaller and not as strong as the superior incisores. The two inferior laterals are larger than the centrals, while the contrary is the case with the superior incisores; so that all of the incisores possess differences that enables them to be distinguished from one another.

The bodies of these teeth are flattened from before backward, and wedge-shaped, their external surface is smooth, convex and a little larger near its cutting edge; their internal surface, which is slightly concave, has a smaller transverse dimension than the external. Their sides are of a triangular form, are generally contiguous to the neighbouring teeth, and are not so highly polished as their anterior or posterior surfaces. These teeth terminate in a cutting edge, which, in children, is frequently denticulated; but becomes worn away by mastication. The edges of the inferior incisores are beveled obliquely backward, while the contrary is the case with the superiors; this is occasioned by the friction of the superior upon the inferior teeth. The inferior jaw of persons who have what is termed jimmer-jaw, overlaps the superior and a contrary wearing away of the teeth is the result. When the teeth close perpendicularly upon one another, denudation is horizontal.

At the edges of the alveoli, the crowns of the teeth terminate in a slight depression which is the neck; this circumscribes the tooth describing zigzag lines, and gives attachment to the mucus membrane of the mouth; it separates the crown from the root, as before stated.

The length of the root of a tooth is generally in proportion to that of its crown. Thus the roots of the superior incisores are longer than those of the inferior, and those of the cuspidati are extremely long, these often nearly reach the base of the orbit, hence they are called eye-teeth. In those teeth upon which the gums are very high up, we find that the part implanted in the alveoli is much longer as the part which is above the gum appears to be shorter. The incisores have single, long and



conical roots, slightly flattened upon their lateral surfaces, where may be seen a small vertical groove. Their roots are surrounded by a membrane which adheres to them by one of its surfaces, and by the other to the walls of the alveolar cavity. The extremity of the roots contains a foramen through which a nerve, artery and vein pass.

The cuspidati are situated posterior to the incisores; they are four in number, two in each jaw. Their crowns are of a conical form, and contain posteriorly a slight concavity; the remaining parts are round. The extremity of the crown presents a kind of tubercle which terminates in a point; its neck is similar to that of the incisores.

The roots of these teeth are single and very large; they have like the preceding teeth, a vertical direction, and a foramen at their extremities for the passage of a nerve, artery and vein.

There are eight bicuspidates; four in each jaw, which are situated immediately posterior to the cuspidati. The crowns of these are cylindrical, and are rounder and more polished in front than upon their sides which is contiguous to the neighbouring teeth. There are two tubercles upon their grinding surfaces, one external and one internal; the former is larger than the latter and is separated from it by a groove running from before backward. Their necks are more regularly round than the preceding teeth; their roots are sometimes single at other times they are double; in this latter case they may be separated, or be partially or totally united; but they are seldom bifurcated near the neck.

The apex of the root when single always contains a foramen, or two when the roots are double, which form a single cavity in the crown of the tooth. Their use are the same as those of the other teeth.

The molares are twelve in number, six on each side of the jaws; the last of these in each jaw is called the wisdom-tooth, and is the smallest. The crown of the molares is somewhat of a quadrilateral figure; the anterior face is more polished and more round than their sides. The grinding surface has four tubercles, two of which are external and are the largest. These tubercles are separated by a crucial groove; they are very hard and generally have unequal surfaces, but are subject to great variations.

They have from two to five roots which at first rise from a common trunk then diverge. After branching out, these roots sometimes approach one another and embrace a part of the alveoli, it is then impossible to extract them without removing with them a portion of the jaw. The apex of each root contains a foramen which gives passage to a nerve, artery and vein. These foramina unite in a common cavity in the crown of the tooth.

*Denudation of the Teeth.*

Mastication wears away the teeth, and gradually produces upon their cutting edges remarkable alterations.

The incisores of children of seven years of age generally have three points, which at the age of three years become effaced. From twenty to thirty years of age the cutting edges of these teeth become materially worn away; from forty to forty-five they are very much worn down upon their edges which contains in their centre a little yellow spot. This is the osseous part of the tooth exposed by the loss of the enamel. At a more advanced period, denudation continuing to increase, the yellow spot enlarges, and the height of the tooth diminishes more and more.

The cuspidati are provided with a point of a diamond shape, upon which denudation manifests itself about the twentieth year of age. About the thirty-fifth year the yellow spot commences to show itself upon each of these teeth; at the fiftieth year, it is very large and the tooth at this period has very sensibly diminished in height. The bicuspidates and molares also have a peculiar mode of denudation. The summit of the external tubercle of the bicuspidates commences to wear away about the twentieth year of age, and that of the internal tubercle at a later period. At about the thirty-eighth year denudation has so far increased as to exhibit yellow spots upon each of these tubercles. About the fortieth year the tubercles are almost entirely effaced: the two yellow spots then uniting form a single one which gradually extends.

The molares are affected by the denuding process in the same manner as the bicuspidates. We are enabled from the changes that the teeth undergo, to judge of the age of the animals. The ages of solipede and ruminating animals cannot be so correctly determined, because they live upon one kind of food and their teeth undergo very little change.

We have pointed out the order in which teeth are denuded in individuals who have a complete and well arranged denture; but there are many circumstances that may produce a variation in this order for instance, when the teeth are badly arranged, and when they assume an oblique direction. A tooth is never denuded when its antagonist is lost. Teeth of persons who constantly masticate on one side are much sooner worn down than the teeth of those who masticate on both sides of the jaws.

The teeth are adapted to their sockets, and are therein retained by a species of immoveable articulation called gomphosis.

Each class of teeth contributes in a separate manner to mastication. The incisores serve to cut aliment, the cuspidati to tear it, and the molares to bruise and grind it. The teeth also serve to retain the saliva, contribute to the articulation of sounds, and serve as an ornament to the countenance.

In advanced age, when the teeth are shortened by friction; and have diminished very much in height, it is observed that their roots are destroyed in the same proportion. As the extremity of the roots diminishes, the alveolar cavity becomes obstructed; the teeth, being gradually forced from their sockets, become loose and finally drop out.

Although in cities the teeth are lost at an early period, their wearing and their premature loss should nevertheless be regarded as a species of disease; for it is not uncommon to see persons of extreme old age possessing a complete and sound set of teeth.

After all the teeth have been lost, the inferior jaw, when closed, occupies a position higher and farther forward, than it did previous to the absence of the teeth; so that the face becomes shorter and the chin more prominent.

When the alveolar border is deprived of teeth, it undergoes remarkable alterations; the bottom of the sockets become obstructed, their parietes approach one another, the alveoli disappear entirely, and the surface once occupied by the teeth, now presents a cutting edge. In consequence of mastication, the gums acquire a degree of hardness, and supply in part the office of the teeth, though in a dull and less energetic manner.

### *Structure of the Teeth.*

Having described the teeth, and pointed out the changes they undergo from their development until their loss, it now remains for us to describe their organic structure, and to relate the results of physical observations and chemical experiments upon their substance.

The teeth are small bones which generally present the texture of other bones; but their crowns are covered with an enamel substance of a white color, which is extremely hard, and is only met with upon that part of the organ.

The osseous portion of the teeth is composed of a dense and serous tissue; the fibres of which it is formed assume various directions, but are generally in the direction of the length of the tooth. When analysed it produces the same results as other bones; one half of its weight is composed of a vascular and parenchymatous tissue, which constitutes the truly organised and living part of the bone. This vascular tissue by its reticular structure forms areolæ, in which is deposited the saline matter that composes the other half of the weight of bone, and imparts to the organ its solidity.

The enamel substance is of a much more serous tissue than the bone, and it contains a very fine vascular tissue, which also renders the enamel organised, and gives it the properties of living principle. It is indeed known that the enamel is disagreeably



affected by acids, which cause the teeth to be, as it is commonly denominated, set on edge, and that it experiences in other respects the various diseases peculiar to bone.\*

If we wish to separate the vascular tissue of a tooth from its earthy matter, we immerse it in mineral acid slightly attenuated with water: the acid dissolves the saline substance, the tooth becomes entirely soft, still preserving its size, but it loses one-half of its weight.

We can separate the earthy from the soft part of a tooth, by placing it in a solution of caustic alkali; the alkali dissolves all of the parenchymatous tissue, and unites with it to form a kind of animal soap, the tooth becomes light, porous, and loses one-half of its weight.

By separating the two substances of a tooth in the above manner, we discover that the soft part is a parenchymatous substance, which by analysis furnishes the product of the animal matter of the teeth. The hard substance is the phosphate and carbonate of lime; this last salt forms only a tenth part of the osseous substance of the bone and enamel.

It was for a long time supposed that the enamel of the teeth, so different in appearance from the rest of the organ, was composed of distinct substances. Some persons have advanced the opinion that the earthy salt of which the enamel is composed, contained a peculiar acid, and others have said that its peculiar appearance is owing to a crystallisation of the pure calcareous phosphate; but minute investigations have overthrown these assertions. In analysing the enamel of the teeth, it is discovered that one-half of its weight is owing to the vascular and parenchymatous tissue that constitutes its true organised and living part; while the other half is composed of the phosphate and carbonate of lime, in nearly the same proportion as in other bones.

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### SECTION III.

#### *The Muscular Apparatus.*

THE muscles which are attached to the inferior jaw are designed to move it in various directions, they elevate and depress it, bring it forward and carry it backward, and enable it to perform rotary motions.

\* The only disease to which the enamel is subject, is chemical decomposition. The author, therefore, is mistaken in supposing that this substance is subject to the same diseases that attack other bone. The degree of vitality with which it is endowed, if indeed it has any at all, is too low to furnish it with attributes such as are possessed by other osseous structures of the body.—EDS.

The elevators are the strongest muscles of the jaw; they, with other parts that we have already named, contribute to adjust its articular surfaces and maintain them in their proper places.

### *Temporalis.*

This muscle is of the form of a triangle, the base of which is round, and attached to the semi-circular ridge upon the temporal bone, and its summit is inserted into the coronoid apophysis. Its numerous fibres converge from all directions of the temporal fossa, and form a strong tendon, which, after having passed under the zygoma, is attached to the coronoid process, so as to surround it on every side. The direction of its anterior fibres descends vertically; and the posterior ones, which are more numerous, come from above downward, and from behind forward. When the mouth is opened very wide, which occasions the coronoid apophysis to be depressed and brought forward, the fibres of the temporalis, from their arrangement, are more or less oblique, and in contracting carry the condyle of the jaw upward and backward, until being arrested by the posterior border of the glenoid cavity, it is carried directly upward against the maxillary bone. That bone may also be slightly depressed by the action of this muscle.

### *Masseter.*

The masseter is a very strong muscle and is of an oblong shape; it extends from the zygoma to the external face of the branches of the inferior jaw as low down as its angle. It consists of three portions which take different directions; the first descends obliquely from the inferior border of the malar bone, as far as the angle of the maxilla; the second comes obliquely from behind forward, from the posterior half of the zygomatic arch to the middle of the external face of the branch of the inferior jaw; the third portion is shorter and more deeply situated than the others, and extends from the whole of the internal face of the zygomatic arch to the upper part of the external face of the branch of the maxilla. This muscle is composed of a great number of muscular and aponeurotic fibres which, by their simultaneous action, elevate the inferior jaw, having a tendency to depress the superior.

### *Pterygoideus Internus.*

This muscle is situated upon the internal face of the branches of the inferior jaw; it is of an oblong form and is very thick. It extends from the pterygoid fossa and from the superior face of tuberosity of the palate, to the inferior and internal part of the branch of the jaw near its angle. Its direction is from above

downward, from behind forward, and from within outward. Its aponeurotic fibres are irregular in length and occupy the extremities of the muscle. Its principal use is to elevate the jaw, at the same time carrying it backward.

### *Pterygoideus Externus.*

This muscle is smaller and situated below the preceding one. It is long and attached to the external side of the pterygoid apophysis and the greater wings of the sphenoid bone. It passes outward and backward, and is inserted into the depression upon the anterior and inner side of the neck of the condyle and of the capsule that surround it. This muscle when it acts with its fellow on the opposite side, draws the jaw forwards; but if it acts alone, it draws the jaw to one side.

The muscles already described are very strong, especially the two first which serve essentially to elevate the jaw in the performance of mastication. It now remains for us to speak of those that are attached to the base of the jaw and serve to depress it.

### *Digastricus.*

This muscle receives its name from its being divided, in the middle by means of a tendon, into two fleshy bellies. It is situated upon the lateral and superior part of the neck, and is inserted posteriorly into the mastoid groove, whence it descends obliquely forward for about three inches; its middle portion is converted into a tendon, which passes through the stylohyoideus muscle and is attached by an aponeurotic loop to the hyoide bone.

The anterior belly passes upward, and is attached by very short aponeurotic fibres to the facet of the inferior maxilla, near its symphysis. The posterior muscular portion is larger than the anterior. These two parts should have distinct uses, since they have different directions and attachments. Indeed, the anterior portion depresses the maxilla and brings it into its natural position, when it has been carried forward. The posterior portion fixes the hyoide bone.

When both parts of this muscle contract, the hyoide bone is carried upward and forward, and in this manner facilitates deglutition. From the points of attachment, it does not appear that this muscle can serve to elevate the inferior jaw, as has been supposed by some authors.

### *Mylo Hyoideus.*

This muscle is flat and of a triangular form; it extends from the oblique line upon the internal face of the maxilla, to the anterior and lateral part of the body of the hyoide bone. Its fibres



are directed obliquely inward, backward and downward. When the hyoide bone is fixed, this muscle depresses and carries the jaw backward.

*Genio Hyoideus.*

This is a thin and long muscle extending from the symphysis of the maxilla to the median line of the body of the hyoide bone. Its use is the same as the preceding muscle.

*Genio Glossus.*

The genio glossus is concealed by the preceding muscle and bears a great resemblance to it. It is attached by short aponeurotic fibres to the symphysis of the maxilla, and upon the lateral parts of the internal maxillary line, thence to the tongue. A great part of its fibres are blended with those of the tongue, running in different directions. The remainder of this muscle is attached to the lesser horn of the hyoide bone and is connected with the muscles of the pharynx. Its action varies according to the direction of its muscular fibres. It assists in depressing and carrying the jaw backward, it shortens the tongue by approximating its two extremities, and it tends to carry the tongue outward or inward, according as its anterior or posterior fibres contract.

*Platysma Myoides.*

This muscle is thin, and situated beneath the skin upon the anterior and lateral parts of the neck. It extends anteriorly, from the superior part of the thorax and shoulder to the base of the face. It arises inferiorly, from the integumentary structure by a few short fibres; at this point it covers a portion of the pectoral and deltoid muscles. The most of the fibres of this muscle are implanted upon the anterior and lateral part of the maxillary bone; the rest of its fibres are blended with the muscles of the cheek.

This muscle may assist in depressing the lower jaw, and cause the integuments of the face and neck to wrinkle. It is frequently so very thin that its action is scarcely perceptible. In the lower classes of animals this muscle forms a very thick, fleshy covering over the muscles of the face.

*Levator labii superioris, et alæ nasi.*

This is a long, flat muscle. It arises at the nasal apophysis and internal angle of the eye; it is covered at the point by the orbicularis palpebrarum. It then descends along the wing of the nose, and enlarges, running outwardly under the skin, to be inserted into the superior lip. The name of this muscle indicates its use.

*Levator labii Superioris.*

This muscle exceeds the preceding muscle in size but is shorter than it. It extends from the inferior and external border of the orbit to the superior lip. It is covered superiorly, by the orbicularis palpebrarum, and is situated inferiorly under the levator labii et alæ nasi to which it adheres. The direction of its fibres is obliquely inward, hence, in contracting, it carries the lip upward and outward.

*Levator Anguli Oris.*

The levator anguli oris is smaller than the two preceding muscles, which are concealed partially by this muscle and partly by the orbicularis palpebrarum and the zygomaticus major. The levator anguli oris arises from the canine fossa; its direction is obliquely outward, and is inserted into the commissure of the lips. It elevates the angle of the mouth.

*Zygomaticus Major.*

This muscle arises from the anterior and inferior part of the malar bone and extends to the commissure of the lips, where it divides to be inserted into each lip.

It draws the corner of the mouth obliquely upward and outward.

*Zygomaticus Minor.*

This muscle is sometimes absent; when present, it is situated on the internal side of the preceding muscle and has the same attachment; it however, sometimes arises from the inferior part of the orbicularis palpebrarum. Its use is the same as that of the zygomaticus major.

*Depressor Anguli Oris.*

This muscle is of a triangular form. It is attached by its base to the external maxillary line, and its apex is inserted into the commissure of the lips. It depresses the corner of the mouth.

*Depressor Labii Inferioris.*

This muscle arises from the side of the chin and upon a level, and to the internal side of the preceding muscle. It runs obliquely upward, is inserted into the orbicularis oris and partly into the skin to which it strongly adheres. Some of its fibres and those of its fellow on the opposite side cross one another. Its use is to depress the inferior lip.

*Buccinator.*

This muscle forms the greater part of the cheeks. It arises posteriorly, from the external side of the dental arches near the

molar teeth; it is also attached to a ligament which extends from the internal wing of the pterygoid apophysis to the internal face of the superior maxillary bone. It is inserted anteriorly into the commissure of the lips where it divides and sends off a muscular slip to each lip. The duct of Steno passes through this muscle opposite the first molar tooth.

The superior fibres descending and the inferior ascending decussate each other near the corner of the mouth; while the lesser fibres take a horizontal direction. The lips, when this muscle contracts, are carried backward and against the teeth as in laughing. It is this muscle that forces the wind from the mouth when blowing the trumpet; hence its name buccinator.

### *Orbicularis Oris.*

The Orbicularis Oris is almost entirely formed of the different muscles that are connected to it. It forms the lips and its muscular fibres are so arranged as to cross one another at the corners of the mouth. This muscle lies immediately beneath the skin to which it strongly adheres; its action is varied. It contracts and rounds the opening of the mouth by forcing the lips forward, and, with the assistance of other muscles of these parts, it contributes to the execution of movements necessary in the performance of mastication, pronunciation, singing, &c.

### *The Structure of the Lips and the interior of the Mouth.*

The lips are composed of muscular fibres, of cellular tissue that unites these, of vessels, nerves, glandular follicles and of a cutaneous or mucus envelope which covers the whole of these parts. The arrangement of their muscular fibres renders the lips capable of numerous and various motions necessary in the performance of their different functions.

The smallness of the transverse opening of the mouth which constitutes the lips, is regarded as a characteristic of beauty; in fact, it is only in man that the lips form an opening sufficiently narrow to prevent the saliva from flowing from the mouth. A large mouth is generally displeasing, as it recalls a disposition analogous to inferior animals. The external opening of the mouth is comparatively larger in the fœtus than at a later period.

The skin which forms the lips exteriorly is of a serous tissue, and adheres strongly to the subjacent parts, and is covered in man with beard, and in women and children with fine down.

When the skin reaches the edges of the lips it becomes finer. It is constantly humid and of a vermilion color, which readily disappears in syncope, fright, &c. At this point it is blended with the lining membrane of the mouth.

Notwithstanding the analogy that has been supposed to exist



between the structure of the mucous membrane that lines the natural cavities of the body, and that of the skin which covers the exterior of the body, they are essentially different. Indeed, the cutaneous organ is composed of derma properly so called, or of skin of mucous tissue which imparts color to the skin, of little glandular follicles, and of epidermis which covers the whole. On the contrary, the mucous membrane of the mouth like that which lines the alimentary canal and bronchial cell, covers nearly always fibrous surfaces more or less apparent, from which it is separated by a layer of dense cellular tissue. At other times it is composed of a thick, fungous, vascular layer which is strewed with glandular follicles of various forms and sizes; but the largest of which are but very small, and give to the surface of this layer the appearance of velvet. There are, however, numerous connections and great sympathy between the mucous membranes and the skin, as we shall have occasion hereafter to point out.

The mucous membrane which lines the interior of the mouth, contains the orifices of the salivary glands, and the excretory conduits of the mucous follicles, from whence flows a viscous fluid which mixes with the saliva. It also contains little grains or glandular bodies which produce a constant moisture in the mouth. The surface of this membrane presents also a great quantity of absorbent vessels, arterial and venous branches, and the terminations of nerves. It will be apparent from the structure of this membrane, that it possesses extreme sensibility, and is subjected to various affections. The lips are divided into superior and inferior; the term commissure has been given to their lateral union. The lips are flattened backward and convexed exterior. The lips of negroes are generally more convexed than those of white persons; this depends partly upon the greater prominence of the jaws in the latter, and partly upon the greater thickness of their lips. The superior lip contains in its middle portion a gutter which is bounded on each side by a slight elevation. The internal face of the lips has attached to their centre a duplicature of the lining membrane of the mouth; this duplicature is more apparent upon the superior than upon the inferior lip, and is called the *frænum*.

The walls of the mouth present, superiorly, a prominence occasioned by the malar eminence; below this, the face of fat and chubby persons is convexed, and depressed in those who are lean, especially if the molares have been lost.

The internal face of the cheeks correspond to the gums and teeth; and in the space opposite the first molar teeth is seen the duct of *Steno*.

*The Posterior wall of the Mouth or Palate.*

The posterior wall of the mouth is a fleshy, moveable partition ; it is attached superiorly to the palatine arch, laterally to the walls of the pharynx, and inferiorly to the base of the tongue. The opening at this part which communicates with the pharynx constitutes the fauces.

The palate presents, at its superior and middle portion, an appendix called the uvula, which is of a conical form and directed downward. In the various affections of the throat it is susceptible of augmenting in size, or of becoming so elongated as to impede deglutition and occasion serious inconveniences. The lateral parts of the muscles of the palate enlarge, descend, and form two pillars ; the anterior pillar terminates at the side of the base of the tongue, and the posterior at the lateral and anterior parts of the pharynx. The space between these two pillars is occupied by an assemblage of glandular follicles, which furnish an abundant secretion that lubricates the surrounding parts. The muscles which are attached to the palate are the glosso-staphylius, the internal and external peristaphylius. These muscles are called staphyli from their insertion into the palate, which in Greek is called staphile.

*Glosso-Staphilus.*

This muscle is thin and situated in the anterior pillar of the palate. Its inferior extremity adheres to the sides of the base of the tongue ; its superior inclines inward along the palate as far as the uvula. When this muscle contracts it draws the palate from the base of the tongue and consequently contracts the fauces.

*Peristaphilius Internus.*

The peristaphilus internus is much stronger than the preceding muscle. It arises from the inferior face of the petrous bone between the two openings of the carotid canal, near the Eustachian tube ; thence it descends obliquely forward, downward and inward as far as the middle of the palate, where it increases in size, gives off some fibres to the pharynx, and unites itself with its fellow on the opposite side by a very fine aponeurotic expansion. When these two muscles contract, they elevate and expand the palate by pressing it against the posterior openings of the nares. They prevent aliment from getting into the nasal fossa during deglutition.

*Peristaphilius Externus*

This muscle is attached, superiorly, to the depression situated behind the base of the internal wing of the pterygoid apophysis, and to the anterior and external part of the Eustachian tube ; it

then descends along the pterygoid apophysis, winding upon the hook of its internal wing, and becomes lost upon the lateral parts of the palate, and renders its application against the opening of posterior nares perfect.

### *Pharyngo-Staphilius.*

It arises from the posterior border of the palatine arch, and contracting as it descends in the substance of the posterior pillar of the palate; it then becomes larger and spreads itself upon the lateral parts of the pharynx. When this muscle contracts, it depresses the palate and assists the action of the glosso-staphilius; it may also slightly elevate the pharynx.

### *Palato-Staphilius.*

The palato-staphilius may be regarded as an odd muscle. It is attached, superiorly, to the spinous process formed by the union of the two palate bones, and descends along the uvula, which it, in a great measure, forms. It shortens and elevates the uvula.

### *The Superior and Inferior Walls of the Mouth.*

The superior and inferior walls of the mouth are covered by the mucous membrane that lines the whole of this cavity. At their anterior parts we observe the gums, which are formed of a thick serous tissue of reddish colour; these cover the alveolar arches and insinuate themselves between the teeth, the necks of which they surround, and to which they are strongly attached. The gums contain a great quantity of vessels and nerves, and unite with the periosteum. Their internal structure is but little understood.

The membranous part that covers the palate is of a smooth, serous and whitish tissue; it contains, however, mucous follicles, which may be seen at the anterior part, where is observed in the middle, a longitudinal line analogous to those in other parts of the body. Between the incisores, where this line commences, is the anterior palatine foramen. It is commonly supposed that the palate is an essential part of the organ of taste; hence we hear of men having very fine palates, meaning that they have good taste; it is certain, however, that the palate does not enjoy this faculty. This fact can be demonstrated by placing any sapid body upon the palate, when a sapid taste will not be experienced unless the substance touches the tongue, which is the sole organ of taste. The inferior wall of the mouth forms a cavity that enlarges as it progresses backward; the mucous membrane which covers it, folds under the tongue and forms the anterior ligament of this organ. In front of this ligament there are two tubercles, to which the canals of the maxillary glands communi-



cate, and upon their sides there are two prominences which correspond to the sublingual glands.

### *The Tongue and its Muscles.*

The tongue is of soft and reddish texture; the muscular fibres of which it is composed form an inextricable tissue. If after macerating the organ for a time in acetous acid, we cut it longitudinally and crosswise, we will discover longitudinal and transverse fibres, and fibres that extend from the upper to the under surface. The tongue is attached to the base of the os hyoides where it is retained by fasciculi of muscles which enter into its formation.

The muscular apparatus of the tongue is composed of the stylo-glossus, hyo-glossus, genio-glossus and lingual. We described the genio-glossus when treating of the muscles that depress the maxillary bone.

### *The Stylo-glossus*

Is a slim, long muscle; it arises tendinous from the styloid apophysis; its fleshy portion descends by enlarging from behind forward, and from without inward. It terminates upon the sides of the tongue near its base. This muscle elevates the base of the tongue, carrying it backward; it also assists, when it acts with its fellow, in enlarging this part.

### *The Hyo-glossus*

Is attached in front of the body of the os hyoides, along its larger horn. It becomes narrower as it mounts upward, and is lost upon the lateral parts of the tongue. This muscle in contracting forces the tongue lengthwise, and causes it to form a longitudinal gutter at its superior part. When the os hyoides is fixed, it depresses the base of the tongue.

### *The Lingual.*

This muscle, which constitutes the greatest part of the tongue, extends from the base to the point of that organ. It is situated between the genio-glossus and the hyo-glossus. When it contracts it folds the point of the tongue under and draws it near the base of the organ. The arrangement of the muscles which compose the tongue, together with the peculiar form and structure of this organ, explains the cause of the numerous and various movements that this organ executes during mastication, deglutition, speaking and singing.

The tongue is covered by a very thick membrane, which is continuous with the common envelopment of the walls of the mouth. This membrane, by being reflected over the neigh-

bouring parts, forms three folds or ligaments which appear to limit the movements of the tongue. The one in front constitutes the frænum or fillet of the two posterior ones; one of these may be called the glosso-staphilus, and the other the epiglottis.

The superior part of the mucous membrane which covers the tongue is of a peculiar structure, and is essentially the organ of taste. This membrane contains papillæ of various forms and sizes. The papillæ appear to be formed of the termination of nerves, blood-vessels, glandular follicles, &c., and are divided into three classes. The first of these is of an inverted conical form; their number varies from seven to fourteen or fifteen; they are situated near the base of the tongue, and form two lines resembling the letter V, the apex of the lines point posteriorly and the base anteriorly. When these papillæ are pressed, a viscous liquid is emitted. The second class of papillæ are called fungiform, from their resemblance to a mushroom; they are attached to the tongue by a pedicle, and occupy the smallest and posterior part of that organ; they are more numerous than the preceding ones. The third class, called pyramidal, adhere to the tongue by their base, and are situated upon the lateral part of this organ near its point; some of these, however, are found interspersed among the two first species.

The pyramidal papillæ seem to be formed of a great many nervous buds. These papillæ, from hunger or the presence of savory food, become erect and are then more observable.

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#### SECTION IV.

##### *Salivary Glands.*

THE salivary glands are not the least important of those organs that enter into the formation of the apparatus of mastication. The secretion of these glands mixes with the food, and is an indispensable agent for it to undergo the preliminary stage necessary for digestion.

These glands are six in number; three upon each side. They are remarkable for their size, but more especially on account of the great quantity of fluid that they secrete.

##### *Parotid Gland.*

The parotid is the largest of all the salivary glands. It is situated below the external auditory foramen, and extends from the mastoid apophysis to the masseter muscle; it is covered by a fine aponeurotic expansion of the platysma myoides and by the skin. It is formed of an assemblage of little glandular bodies, united by cellular tissue. In other respects, it is of a serous tissue of a

pale red colour, and contains a great number of blood-vessels and nerves.

Each of the little glands of which this organ is composed gives off as many little tubes, which unite and form the superior salivary canal, (the duct of Steno). This excretory conduit arises anteriorly, near the summit of the parotid gland, thence it passes forward to the anterior border of the masseter muscle, about an inch below the zygomatic arch. At this point it penetrates the cheeks, through the buccinator muscle, and opens into the mouth opposite the second superior molar tooth.

The parotid, like all conglomerate glands, is surrounded by a great many vessels and lymphatic glands. It secretes during mastication a great quantity of saliva. The secretion of this organ is increased by sour food, hunger, and the various substances that have a specific action upon it, and by pressure during the motion of the jaw in mastication.

#### *Maxillary Gland.*

This gland receives its name from its position, which is upon the internal side of the maxillary bone, near its angle. It is situated behind the posterior border of the mylo-hyoideus muscle, and united, posteriorly, to the parotid by cellular tissue. In colour and consistence it resembles the preceding gland, and it appears to have the same internal structure.

Its excretory duct is called the duct of Wharton, though it was described one hundred and thirty years before him by Berenger of Carpi. This duct is formed by the union of little canals which arise from the different glandular bodies. It arises from the anterior part of this gland, passes beneath the mylo-hyoideus muscle along the sublingual gland, from which it occasionally receives some of its conduits, and also those of other little glands in the midst of which it passes. It opens into the mouth under the tongue and upon the side of its anterior ligament.

#### *Sublingual Gland.*

This gland is of an oblong shape slightly flattened, and smaller than the two preceding glands. It is often united to the maxillary gland. It has about twenty excretory ducts, which are so small as to be scarcely visible; the orifices of these open in front and underneath the tongue. Of the three glands of which we have spoken, the parotid is the largest, and consequently furnishes the greatest quantity of saliva. Sabatier relates a case of a soldier who would wet three napkins during a short repast, with the saliva that escaped externally from the duct of Steno, which had been accidentally wounded. Gavard says that he saw, at the Hotel Dieu in Paris, a man similarly affected, and



who lost at least two ounces of this fluid during a repast of ten minutes. The abundant secretion furnished by these three salivary glands is of a serous kind, and its chemical composition appears to be but little understood. It mixes in the mouth with a viscid fluid furnished by mucous follicles which are situated upon the sides of the mouth, the tongue, or lips; the combination of these two fluids constitutes the saliva. The food during mastication becomes saturated with the saliva, and is thus prepared for digestion. To terminate the anatomy of the mouth, it only remains for us to describe the origin and distribution of the nerves and arteries that ramify to the various parts of the mouth, the formation of veins which return the blood, and lastly, the disposition of vessels and lymphatic glands which convey the residue of the various secretions necessary for the apparatus of mastication.

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## SECTION V.

### *Nervous and Vascular Apparatus.*

THE nerves which are distributed to the different parts of the mouth that have been already described, are branches of the fifth, seventh, eighth and ninth pairs.

The fifth pair of nerves, also called the trigeminus, from its dividing into three branches before it escapes from the cranium, arises from the pons varolii and the crura cerebri, by a great number of separate fillets.

Of the three branches of which this nerve is composed, there are only the second and third branches, called the superior and inferior maxillary branches, that supply some of the parts of the mouth.

The superior maxillary branch gives off the anterior and posterior dental fillets; it also enters into the formation of the sphenopalatine ganglion, which sends off the palatine and sphenopalatine nerves.

The inferior maxillary branch is larger than the preceding; it furnishes the masseter, deep temporals, the pterygoid, the superficial temporal, the lingual which imparts to the tongue the faculty of receiving the impressions of acids, and finally the inferior dental nerve.

The seventh pair, or auditory nerves, arises from the lateral and posterior parts of the annular eminence by two cords, called the portio dura and portio mollis. The portio dura gives off some nervous twigs to the parts of which we have been treating: viz. the vidian, the temporal, malar and buccal branches.

The eighth pair of nerves, or the parvagus, derives its origin

from the lateral and superior parts, medulla oblongata, by numerous fillets which pass out of the cranium, through the posterior foramen lacerum. The glosso-pharyngius is derived from this nerve.

The ninth pair is called the gustatory or lingual nerves; it arises from between the corpora pyramidalia and olivaria by several fillets, which unite and pass out of the cranium through the anterior condyloid foramen. This nerve distributes branches to the tongue, by which it imparts to this organ the faculty of motion.

### *Arteries.*

The aorta furnishes at its origin a large trunk, (the primitive carotid,) which divides at the summit of the larynx. One of those divisions supplies the interior of the cranium, and is called the internal carotid; the other is distributed upon the exterior of the head, and is the external carotid. It is from the external carotid, that the arterial branches which supply the different parts of the mouth are derived. The external carotid is more deeply seated than the internal, its direction is upward and outward, as far as the body of the condyle of the maxillary bone; before it reaches this point it gives off eight principal branches, one half of which furnishes arteries to the parts that demand our special attention.

The lingual artery gives off the sublingual branch. The labial furnishes the musculo-palatine; the sub-maxillary, the tonsilaris; the inferior labial, the two coronaries.

The external carotid, arriving at the posterior part of the condyle of the maxilla, gives off two posterior branches. One of these is the temporal, which furnishes the anterior auricular and the transnasalis facii; the other is the internal maxillary, from which is derived the inferior dental, the zygomatic-maxillary, the masseter, the buccal, the palatine and the sphenopalatine. All of these branches, in their distribution to the parts that are indicated by their names, divide and subdivide into an infinite number of branches, and present frequent anastomoses with one another.

### *Veins.*

The arterial blood, after having furnished the various parts with materials for nutrition and secretion, returns through numerous veins that follow the course of the arteries, the names of which they receive. The venous branches empty into the internal jugulars.

### *Lymphatic Vessels and Glands.*

Serous liquids, the residue of all the secretions, return from the various parts of the mouth, by lymphatic vessels. These

vessels originate from extremely fine roots. These last re-unite and form branches which empty into the great lymphatics.

The lymphatics situated in the skin covering the lateral parts of the head and cheeks, empty into the little glands situated about the parotid gland. Those that are situated upon the wings of the nose, the lips, the cheeks, and the lateral parts of the face, empty into the sub-maxillary glands, situated upon the internal sides of the jaw. Lastly, those which are derived from the tongue, palate, posterior nares, and some more distant parts, join the sub-lingual glands, the name of which indicates their position. The lymph, after being elaborated in these different glands by means of an order of vessels which accompany the divisions of the veins, proceed to unite to those at the anterior part of the neck.

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## PHYSIOLOGY OF THE MOUTH.

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### SECTION I.

#### *Mechanical Function of the Apparatus of Mastication.*

MASTICATION is performed by the motion of the inferior jaw, and by means of the teeth. To understand this phenomenon, we must examine; 1st, the relation of the superior maxilla, against which all the force during mastication is applied; 2d, that of the inferior jaw which executes the movements by means of the muscles that are attached to it.

#### *The Adaptation of the Superior Maxilla for Mastication.*

The superior maxilla is thick and solidly retained in its position by several neighbouring bones. Thus, the nasal apophysis is united to the coronal by a denticulated and bevelled border. That apophysis is slightly inclined inward, and articulates with its fellow near the most solid part of the frontal bone, forming at this point a kind of roof; this arrangement renders these bones very firmly fixed in their positions, and diminishes a little the movements transmitted along this apophysis. On the other hand we discover the malar eminence of the maxillary bone united to the anterior border of the zygoma by a broad surface, which is turned partly posterior and partly anterior. It should also be noticed that the malar bone is also joined to the frontal, so that it is by this last bone that all the motions that are transmitted upon the alveolar border are sustained. The maxillary receives a great support posteriorly, from the palatine bones, which are



themselves sustained by the sphenoid bone which is situated in the middle of the base of the cranium, and articulates with nearly all the bones of the head.

From this general view, we discover that the maxilla is very solidly sustained by the neighbouring bones, and especially by the frontal bone. In front it is supported by the nasal apophysis of the frontal bone, and posteriorly by the zygoma; so that the part of the alveolar border of this bone, against which the greatest force in mastication is exercised, is the most secure and well adapted to sustain a shock.

It necessarily results from the arrangement of the superior jaw that the motion communicated to the alveolar border by the inferior jaw, should pass to the sides of the orbits to be transmitted obliquely to the frontal bone, whence it passes along the bones of the cranium. In fact, in all violent motions upon the superior teeth, a very remarkable shock is experienced near the top of the head; it is also known that the pain that is experienced when a handkerchief has been forcibly withdrawn from between the teeth, in case of injury of the cranium, has been, for a long time, regarded as a sign of fracture: but this is simply a consequence of the motion communicated to the forehead, thence to the organs, which a shock more or less violent has rendered very sensible.

That part of the superior maxillary bone in which the incisores are implanted, is situated under the opening of the nasal fossæ, and is but slightly sustained; but the force is not great that it has to resist, it being the most distant part from the fulcrum; it is, nevertheless, firmly adjusted by the mode of connection of the maxilla to each other by means of their thick and denticulated crests. That portion of the jaw which receives the last molares is likewise found not to be strongly supported; but great force is never exercised at this part, from the difficulty of placing very far back into the mouth, substances that we wish to grind.

The maxilla is not only well adapted to sustain the motions of the inferior jaw, but also all shocks that it may receive from falls without being displaced. It is retained interiorly by the zygoma, which is connected to the temporal arch. It should be remarked that, in its connection with the neighbouring bones, the articular surfaces are bevelled alternately in different directions: so that it is likewise retained on all sides similar to nearly all the bones of the head.\*

\* See the Memoir of Hunaud, upon the connection of the bones of the cranium; and that of Borden upon the connection of the bones of the face; recorded in the Memoires de l'Academie des Sciences.

*The Inferior Jaw, and the Action of the Muscles that are attached to it.*

The inferior jaw contains an articular condyle, the formation of which is well adapted to the great and easy motions of the jaw. The jaw can be depressed and elevated, carried slightly forward and backward and perform a rotary motion.

The jaw is depressed by the action of all the muscles that are attached to it and the hyoid bone, and by the digastricus which is attached to the mastoid apophysis. All of these muscles are very thin, and proportioned to the slight force that they have habitually to perform; but if their action is exercised with violence, as in yawning, it may produce luxation of the jaw. This accident is more apt to occur in persons of a certain age, the branches of whose jaws form nearly a right angle with the body of this bone, because the condyle can, in such case, be easily brought forward in opening the mouth very wide; while displacement cannot take place in young subjects, the condyles of whose jaws are almost upon a line with the body of the bone.

The elevation of the jaw is effected by the action of the temporal, masseter, and the two pterygoid muscles. The two first of these are the strongest; the temporal muscle firmly adheres to the temporal bone, and progressing downward, surrounds the coronoid apophysis. This muscle in very ravenous animals, as the hyena, is very large and strong. It extends upon the whole side of the cranium and is attached to a longitudinal crest upon the top of the head.

The masseter is attached by one extremity under the zygomatic arch to the zygoma, and to the part of the maxilla which is united to it, and by the other extremity to the external side of the branch of the inferior jaw. It is short, very thick and properly situated to act most advantageously in elevating the jaw.

The internal pterygoid muscle tends to carry the jaw backward and upward, and the external to direct it forward.

When the jaws are open to break a substance placed between the teeth, the motion is performed by a very unfavorable leverage. The muscular action which is the power, is situated at the fulcrum which the condyle of the jaw assumes in its articulation; and the resistance which is the power it possesses near the body, placed between the teeth, has the disadvantage of being situated too near the fulcrum, and consequently the lever is too short. It is in this kind of articulation, as in nearly all those of animal mechanism, that the muscular power is adapted to the unfavorable position of the levers.

Mastication is performed most advantageously upon the sides of the jaws between the bicuspides and first molares, near the

muscular power; it is at this point that hard bodies that we may wish to break are placed. When we merely wish to cut food with the incisores, or to tear it with the cuspidati, a great force is not required.

The motions which are exercised anteriorly, posteriorly, and upon the sides of the jaw, may by their combination produce a rotary motion necessary in grinding alimentary substances. This rotary motion is owing to successive or simultaneous action of the different muscular powers; the muscles on the right and left side act alternately. All muscles which are attached to the inferior jaw, even those that contribute to depress it, assist in the production of this movement of mastication, which can be better imagined than described.

The inferior jaw, which in its constant motions presents a lever of the third species, may, under some circumstances, offer examples of the two other species of levers. Thus, when a substance is placed between the last molar teeth, and consequently as near the point of support of the jaw as possible, the direction of the muscular action changes in relation to the anterior fibres of the masseter, and the resistance may then be between the point of support and a part of the power.

In cases of luxation, it may happen that the jaw being greatly depressed, and the condyle carried far forward against the transverse apophysis of the temporal bone, a part of the action of the temporal and masseter muscle and particularly the pterygoid, is exercised behind the condyle. This then has its fulcrum in the middle and forms a lever of the first species; the muscular action, in this case, tends to favor luxation, instead of carrying the jaw into its proper position.

Although we have said that in mastication, the motions of the jaws, are referable to the inferior maxilla; we must, however, observe that the superior maxilla contributes in part to this motion. It is said that when the mouth is opened, the inferior maxilla is depressed four-fifths while the superior is elevated one fifth. To ascertain the truth of this, an individual has stood before a mirror, placed between his teeth the blade of a knife, which was held tight, and in opening the mouth the distance above and below the blade was estimated; but it will be readily perceived that this elevation of the superior jaw is owing to the motion of the head which is slightly inclined backward, by a movement upon its articulation.



## SECTION II.

*Organic Function of the Apparatus of Mastication.*

THE functions of the mouth are as important as they are numerous. The muscles which form its lateral walls or the cheeks, and those that surround the lips, contribute in a great measure to the expression of the physiognomy. Sound produced at the opening of the larynx is modified by all parts of the mouth. This combination of organs is essential to mastication.

In the dissection of the muscles of the face, it is observed that all these parts are united to one another by adipose cellular tissue, looser and finer than in other parts. This arrangement explains in a measure the extreme mobility of which the muscles of the cheeks are susceptible.

Short and flat jaws, great mobility of the muscles of the face, a small mouth, well formed and animated eyes, are the principal characteristics by which the countenance of man is elevated above that of other mammiferous animals. It is observed that the more marked these characteristics are, the more noble and expressive is the physiognomy; at least when they have not been degraded by heinous passions or habitual debauchery.

When the countenance deviates from these characteristic traits of beauty, it resembles that of brutes in so striking a manner that we naturally discover in them a resemblance to several animals, as may be seen in the celebrated work of Lavater. If the physiognomy remains unmoved and without expression, as in nearly all animals, the muscles of whose face are only fleshy membranes, which are only exercised in howling or masticating; if the eyes are round, large or very small, and move but slightly; if the mouth is large as in large carnivorous animals, we find that all these characters present an aspect more or less repulsive. This resemblance, however, to the inferior class of animals may be partly effaced or entirely obliterated by soft and kind feelings, and by constantly endeavouring to express by the countenance the sentiments resulting from the intellectual faculties.

The mouth contributes essentially to the formation of voice and speech. The air escaping from the lungs traverses its cells, enters the trachea and makes its escape with more or less force. This air meets in the trachea with the cartilage that covers the glottis (epiglottis) and causes it to vibrate like the reed of a haut-boy; the shaking of the cartilage gives motion to the air which surrounds it and sound is produced. The sound afterward traversing the different parts of the mouth and nose becomes modified by these organs. The vocal organs of man, and those of the various mammiferous animals, differ very much from those

of birds. Sound in birds is produced at the base of the trachea, by the motion of two membranous folds, which form, in part, the opening of the two branches. Sound produced at this inferior larynx becomes modified as it progresses, along the trachea, at the superior larynx, and in the beak, by the various forms of which these parts are susceptible. In man, sound produced by the motion of the epiglottis is strong or weak, grave or acute, according as the larynx is shortened and dilated, or lengthened and its calibre increased by the different movements of the neck, in consequence of the force with which the air is expelled by the lungs and according as the glottis is more or less opened. Sound thus produced is afterwards modulated by the various parts of the mouth and nose in order to form the voice and speech. It may be modified in the mouth by the different positions of tongue, cheeks, teeth and lips. The loss of the front teeth is a great obstacle to a correct pronunciation; which is very perceptible in persons, thus affected, who speak or sing in public. It should be observed that the kind of apparatus of the vocal organ of man produces a quality of sound exceedingly disagreeable, as may be noticed in the cries of an infant; and it cannot be conceived how man can attain the art of drawing from such an instrument, sounds as harmonious as some produced. This is a proof of the great flexibility of these organs, and of their aptitude to overcome the greatest difficulties by long practice.

The function of the mouth is at the very commencement of life called into requisition, and that which is very necessary to life is mastication. This preparatory function of digestion is much more important than is commonly supposed.

Food should be well masticated, in order to be properly digested. It is generally remarked that persons who masticate their food well, have an easy digestion and enjoy good health.

The conversion of all kinds of food into a homogeneous pulp, and which contains a chyle always of the same nature, is one of the most beautiful and astonishing phenomena of the organization. It can readily be conceived that it requires nothing less than the action of an apparatus as extensive as that of digestion, to perform this operation perfectly. Hence it is not astonishing that a slight derangement or a defect of action of one part of this apparatus should ultimately affect the performance of this function.

Mastication being indispensable for good digestion, it will be discovered that those who have bad teeth can only exercise this function in an imperfect manner. The stomach, suffered to receive aliment that has not undergone this preparatory process, gradually becomes weak; hence, persons who have bad teeth are said to have weak stomachs. There is, however, another cause that may produce the same effect: it is the connection and

intimate union that generally exist in all the parts of the same apparatus; in such a manner, that when an apparatus is weak or diseased we also find symptoms of that derangement in all its parts. Hence, in a bad condition of the digestive apparatus, the teeth will soon become carious and give rise to frequent pain, the mouth will often be the seat of aphthous affections, the breath will be disagreeable, there will be heaviness in the stomach, flatulency, and alternately diarrhœa and constipation.

It is in feeble children, particularly during dentition, that we can discover the sympathy which exists in the different parts of the digestive apparatus; for it is known that the painful affection of the gums nearly always occasions, at this period, a derangement in the alimentary canal, which is indicated by a more or less obstinate diarrhœa.

The incisores serve to cut, the cuspidati to tear, and the bicuspidæ and molares to grind aliment: these different processes of mastication are important in many respects. It is well known that organs which are properly used acquire more strength and are preserved in a better state of health than those that remain inactive; hence the teeth require the performance of their functions. The act of mastication preserves the teeth in a state of cleanliness, and prevents the accumulation of tartar upon them. Lastly it is necessary that the food be properly masticated, to enable it to undergo the preliminary and indispensable process of digestion.

It is interesting to examine in detail this important function of the various parts of the mouth. When food has been put into the mouth, and has commenced to be masticated, its savoury quality is soon felt by the nerves of the tongue and by the walls of the mouth.

It has not been ascertained what is the precise nature and common properties that the substances which affect the organs of taste enjoy; but it is observed that all very sapid bodies are very soluble in saliva, or in waters which compose it, as acids, alkalis, alcohol, many of the salts, &c. It appears that the great solubility of these substances favours the savoury action which they exercise upon the organs of taste. It is observed that the parts that enjoy the greatest degree of the faculty of taste is particularly the tip of the tongue, together with its surface and the lips; and that the palate is not susceptible of this property, as has been commonly supposed.

When the organs of taste are put in action by food, it is remarked that nervous papillæ swell, become erect, and are very apparent: this takes place more particularly among epicures.

Aliment stimulates the organs of taste, and also increases the action of the salivary glands; the secretion of saliva, being established, is afterwards kept up by the taste of the food which the person continues to take, and by the act of mastication.



As the flow of saliva is always a concomitant act of digestion, the secretion often commences from the mere association of ideas; thus, every thing that calls to the mind of an epicure who is impatiently waiting for his dinner, the delicious food that he is to enjoy, commences to put in action the salivary organs. This has given rise to the common phrase, "*your mouth waters.*"

As the aliment is ground by the teeth, it becomes, when properly masticated, completely saturated with saliva. It should be observed that during mastication the food is necessarily mixed with a certain quantity of atmospheric air, which surrounds the viscosity of the saliva, and which contains its albumen.

Aliment properly masticated is reduced to a pulpos mass which becomes tasteless and requires to be swallowed; it is collected together in a bolus, and by the action of the tongue and walls of the mouth is carried to the posterior part of the mouth, pressed against the palate and pushes the uvula against the posterior opening of the nares. The bolus passes into the pharynx, down which it descends pressing the epiglottis upon the glottis. The neck now elongates, and by a simultaneous action of these parts, the aliment traverses the œsophagus, and is carried into the stomach. The food does not, as some anatomists contend, fall into the stomach by its own weight.

When mastication is properly performed, in a young and healthy person, the lips are of a vermilion colour, the teeth white, and all parts of the mouth exhibit that state of freshness which characterizes health. But under various circumstances of disease, these parts show phenomena of numerous derangements, which shall be the subject of the second part of this treatise.

## PART SECOND.

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### DISEASES OF THE MOUTH.

THE various anatomical apparatus of organs which enter into the formation of the mouth, and of which we have already spoken, are subjected to a variety of diseases. These diseases may be peculiar to the mouth, or they may depend upon a general affection of the system of organs to which they appertain.

We shall present, in the following order, the history of the diseases of the mouth: 1st, those which originate in the mucous membrane that lines the mouth and forms the gums; 2d, the numerous and various affections which have their seat in the substance of the various parts of the mouth; 3d, those that are peculiar to the salivary and lymphatic glands; 4th, nervous or rheumatic affections; 5th, diseases of the maxillary and palate bones; 6th, those peculiar to the teeth, and which constitute the principal object of this work.

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#### SECTION I.

##### *Diseases of the Mucous Membrane of the Mouth.*

THE mucous membrane, which lines the mouth, covers the tongue, forms the gums and spreads itself as far as the edges of the lips, is subject to a variety of diseases.

##### *Chaped Lips.*

The lips of some persons become chaped from the effects of cold, and more particularly from cold winds. The lips sometimes become excoriated, and the epidermis detaches itself in flakes, at other times there will be very numerous and very deep clefts in them.

This affection has occasioned the manufacture of a variety of lip salves; nearly all of these are composed of oleo-mucilaginous substances, or of cerate coloured red. These salves, when spread

upon the lips, protect them from the air and impart a handsome red colour.

### *Aphthæ of the Mouth.*

Under various circumstances, the mouth becomes the seat of little ulcerations, that have been called aphthæ. This disease rarely occurs alone; but generally accompanies catarrhal affections, simple mucous fever, and some fevers of a malignant character.

Aphthæ manifest themselves by little flat pustules of an ash or whitish colour. We at first discover a little, inflamed point; afterward a little cuticle is formed, which detaches itself, and the part thus excoriated becomes extremely sensitive.

Sometimes these pustules are separate and scattered over the different parts of the mouth, pharynx and œsophagus, so as to impede mastication, deglutition and even respiration.

In some cases aphthæ are very numerous and confluent; they then produce extensive ulceration, covered by a whitish and tenacious cuticle; when the disease is on the decline, a great quantity of mucous and membranous shreds are discharged from the mouth.

Some persons are affected with aphthæ during cold and wet weather. Indigent persons, such as are of a bad constitution, and such as reside in low and humid districts, are often subjected to this complaint.

I have frequently had occasion to observe that persons who have often taken mercury, and who were of a lymphatic constitution, were very much disposed to attacks of this disease, which would appear from time to time, and continue for a long period.

In such cases, the repeated action of mercury upon the mouth induces a degree of sensibility or weakness, which renders it subject to that affection. It then often happens that these aphthous eruptions are mistaken for chancres, as in cases where the venereal disease has not been perfectly cured; under this hypothesis, mercury is again had recourse to, which only makes the patient more susceptible to the affection.

Vagler has often seen mucous fevers terminate in numerous aphthous eruptions, and in an abundant salivation. Children are particularly subject to the different species of aphthæ which have received various names. This affection sometimes occurs epidemically in hospitals for children, and would appear to assume a contagious character among the children who were in the neighbourhood.

It often happens, with persons of a catarrhal constitution, and who have decayed teeth, that their gums, in cold and wet weather, become turgid, swollen and very painful; the teeth which are then loosened, sometimes threaten to drop out. This affection



generally occurs where there are decayed teeth; sometimes it extends over the whole of one or both sides of the jaws.

Some practitioners regard this disposition as a scorbutic disease, for which they generally prescribe anti-scorbutic remedies; were we to assent to what most practitioners assert, we would be led to believe that scurvy is a very common disease among all classes of society.

This opinion is carried to such an extent, that a dentist of Paris, in a modern work, has said, "that three-fifths of the inhabitants of large cities are of a scorbutic constitution.\*

Aphthous affections originate generally from a catarrhal disposition, which particularly manifests itself upon the mucous membrane of the mouth; it is also very often kept up by the presence of tartar or decayed teeth. Catarrhal constitutions are overcome by cleanliness, exercise, healthy locations, good nourishment and the use of tonics, and all means capable of imparting force and energy to the whole organism. Aphthous predispositions of the mouth may be removed, if the teeth are kept clean and such as are decayed be extracted. We should also use a gargle containing some stimulating substance, as spirituous liquors; great benefit is often derived from chewing scurvy-grass or other plants of the class of cruciferæ.

We have said that, in scorbutic affections, the gums become turgid, fungous, of a livid red colour, and present fleshy excrescences, often very large. As the foregoing symptoms are also often observed in other affections, and as it is important not to confound them, we shall give a history of scurvy, in which can be seen the nature of the phenomena which this disease produces upon the mouth.

### *Scurvy.*

Scurvy has a greater tendency to make its appearance among persons who are collected together in great numbers, those who live on the banks of rivers and in marshy districts, when confined to narrow, humid and gloomy localities, when their nourishment is not good, and restricted in quantity, than it does in persons differently situated; thus it will be readily perceived why mariners are so frequently affected with this disease, particularly during long voyages.

To the foregoing causes of this disease may be added a feeble constitution, protracted disease, excessive fatigue and depression of spirits.

This disease generally commences with a feeling of weightiness, general lassitude accompanied by a pale and swollen coun-

\* *Theorie et pratique de l'art du dentiste; par Laforque, p. 65.*

tenance. The patient soon experiences an itching and pricking sensation in his gums, which afterward become very sensitive, soft, spongy, of a livid red colour, and bleed upon the slightest touch; he is also troubled with pain in all his limbs, along the back, and often in his breast.

After a lapse of time, the patient feels great lassitude in his legs, and pains in the knee-joints; the ankle-bone soon becomes swollen; and this swelling gradually extends along the limb; nodes then make their appearance, and sometimes the calf of the leg assumes considerable hardness. Sometimes, instead of swelling, the legs waste away and become extremely dry: the patient finally discovers his inability to walk, because his limbs bend under him and continue in that state. Very often, at this period, there will be hemorrhage of the nose, dysentery and discharge of blood from the gums. As the disease progresses, the gums augment in size, they become soft, very fetid, ulcerated and finally gangrenous: then the teeth which are blackened become loose and drop out, and the patient is often troubled with an abundant salivation. In some cases we observe that the face very soon becomes œdematous, the serum poured out settles in the most depending part; the œdema frequently disappears and again appears a short time after. Notwithstanding all these evils, there will be little or no fever; the appetite is good, and the intellectual faculties remain in all their integrity. When the disease has continued for a long time, the pulse becomes small and frequent, and the patient is troubled with great heat and thirst. We generally observe that, so long as they remain quiet in bed, they appear to enjoy a sufficient degree of strength; but if they become restless, if they rise, they become very weak, experience acute pains, and sometimes die very suddenly when moved too forcibly, and when exposed to a current of air.

At the close of the disease, the skin upon the legs burst wherever nodes have formed; the ulcers resulting from them become malignant, and they are often covered by clots of blood; if these clots are removed, a hemorrhage difficult to arrest may ensue, or we will discover, on the succeeding day, the formation of new clots. These ulcers are very much disposed to become gangrenous.

Scurvy generally lasts several months, during which time the patient is predisposed to contract prevalent diseases, especially malignant fevers, under which he unavoidably will sink.

In dissecting persons who have died with this disease, we discover serous and bloody infiltrations in all the tissues, and the soft parts undergo a peculiar alteration, which causes them to lose their ordinary adhesion, so that they can be readily torn. Sometimes we find traces of phlegmasia in some of the viscera,

and an alteration of the synovia in the articular capsules, and finally decay of several of the bones.

The surest method of arresting the progress of this disease, is to remove the causes that may have produced it; the patient should be conveyed to a dry and well ventilated situation, he should have healthy aliment, vegetables, fresh meats, good wine, &c. these, together with good air and exercise, will enable the patients to recover the natural colour of their face, the gums will become more firm, they will lose their wan colour; generally a slight perspiration will supervene, after which all the symptoms of the disease will entirely disappear.

When, however, persons of a feeble constitution are a long time affected with this disease, they generally become subject to rheumatism. When the disease has lasted for a very long time, there will be chronic diseases of the viscera, dropsy, &c., and the patient perishes in a kind of consumption.

Scurvy is essentially owing, as we have before stated, to a long continued influence of dampness upon the body. The action of this cause may be afterward favoured by all such means as are capable of diminishing the vital energies. Thus, scurvy oftener attacks weak, indolent and lazy mariners, than those who are active, robust and laborious. It is uncommon for this disease to attack officers, who are well provided with the comforts of life.

Since humidity is the principal cause of scurvy, it is not at all astonishing that this disease occurs more frequently upon sea than upon land. Under some circumstances it is known to occur upon sea very violently, while, under similar circumstances, and where there is a great deal of moisture, it may be seen to produce the same effects upon land; so that there is no essential difference between land and sea scurvy.

Hence, scurvy has been known to assume an epidemic character in all places habitually covered with water and thick fogs, where the numerous and half civilized population were ignorant of the means of avoiding the causes of the disease.

Scurvy was endemic for a long time in Holland, and when the surface of that country only presented meadows covered with water, and its numerous inhabitants, badly sheltered and nourished, lived in low, small and gloomy cottages. The disease disappeared as the inhabitants, by industrious habits, removed all these causes of the unhealthiness of the country. Thus the numerous canals of this country have given easy and free circulation to the stagnant waters, the houses are more elevated, better ventilated, and kept remarkably clean. Commercial enterprise has enabled the inhabitants to be better nourished and sheltered. Scurvy has now entirely ceased to appear among the inhabitants of this country.

The causes that we have mentioned as producing the disease



under consideration is so manifest, that it has been known to appear several times, in the same country, during the time of war, when the inhabitants, for their security, were obliged to inundate their country, especially when, by a long siege they were deprived of the necessaries of life.

What we have said of Holland, has been noticed in several countries of the north, as in some parts of Russia, Scotland and Ireland.

This disease is also seen in large cities, particularly among the lower classes, and among those who inhabit confined, gloomy, damp and filthy streets, and who are badly nourished, and confined to hard labour. It is likewise known to occur among other classes of society. It attacks such as have been very much weakened by long sickness and grief. Many chronic diseases terminate in a kind of scorbutic affection.

Scurvy is not contagious, as has been for a long time supposed; but it will be perceived that it may exhibit itself at the same time in a great number of individuals, under the influence of the causes capable of producing the disease: so that it is from its epidemic character that it has been supposed to be contagious.

From what we have said, it is easy to discover the true character of the disease. When a dentist discovers the gums of his patient to be thick, fungous and of a livid red colour, the teeth to be loosened, the breath fetid, he can soon discover if these symptoms appertain to a scorbutic or catarrhal affection. Thus, when the patient has a pale countenance, the skin of a dull white, a little œdematous and covered with blotches of a brownish red colour; if he experiences pain in his limbs, and a general weakness, if he has been exposed for a time to the influences of damp air, and if, with these, he has had long sufferings, no matter of what kind they may have been, the disease is evidently of a scorbutic nature. When, on the contrary, we do not witness these phenomena in so marked a manner, when the disease of the mouth is, in a measure, merely local, it evidences the disease to be of a catarrhal nature.

Fungous excrescences that appear upon the gums in scorbutic affections, often grow to a very great size. Sometimes these excrescences are livid red, at other times they are of a sandy grey colour, and they vary in form. They may be either fungous, having a broad or narrow base, or they may be scales, having the appearance of being torn. They differ also in consistency; sometimes they are firm, and require to be cut; but generally they are soft, and may then be generally destroyed by touching them with muriatic acid. In some hospitals where scorbutic patients are treated, this operation, which is called *batonnage*, is performed with a little piece of stick, furnished at one end with a piece of of linen dipped in acid, and with this the gums are rubbed.

*Angina.*

The membrane that lines the posterior mouth, the pharynx, the trachea and the larynx, becomes inflamed and presents diseases which vary in their nature and intensity, according to the part affected and the character of the disease.

Angina has been termed, according to the part affected, angina tonsillaris, angina pharyngius, angina trachealis, angina laryngitis.

When the patient experiences great difficulty in swallowing; when pain is felt, during mastication, in the ear along the Eustachian tube, with a kind of crepitation; if, on looking into the throat, the tonsils and palate are discovered to be very much inflamed; lastly, if there be an abundant secretion of mucus, the disease is seated principally in the tonsils.

When the pharynx is affected with angina, deglutition will become laborious, and the person's food, taken into the mouth, will pass into the nose; respiration is generally easy. In this species of angina, the inflammation is also visible in the posterior part of the mouth.

When deglutition is but slightly impaired and no redness is observable in the throat, and the patient experiences great difficulty in breathing, suffocation, an acute pain in moving the pharynx, has a sharp, whistling voice, the angina, in such cases, is seated in the larynx, or superior part of the trachea.

An affection of this kind generally attacks children under twelve years of age, and proves fatal in a very short time. This disease has been very accurately described by Michaelis.\*

Sometimes the symptoms of the disease are moderate and in some measure purely phlegmatic; at other times it is accompanied with such violent inflammation that the parts affected become gangrenous.

Angina is not always a local affection; it frequently accompanies other diseases. It is sometimes accompanied with derangement in the digestive apparatus. The most serious disease of this kind is attended with fever of a malignant character; the disease in such cases is generally epidemic, and produces great ravages.

When the tonsils have been affected with angina, they very often remain ulcerated, hard or scirrhus, and require removal. The extirpation of the tonsils may be effected with the hook and bistoury; these are the most certain means; sometimes the operation is performed with the kiotome: if the patient should, through fear, be unwilling to undergo this operation, the tonsils can be removed by means of a metallic or silken ligature well waxed. The most convenient manner of applying the ligature around the

\* Michaelis, de angina polyposa, sive membranacea.

tonsils, is to use the ligature-carrier, invented by M. Desault. When the ligature has been applied, it should be tightened every day, until it has cut entirely through the tonsils.

In cases of inflammatory sore throat, the uvula becomes so elongated and tumefied as to assume sometimes a considerable size: strong acidulated gargles are, in such cases, very proper. But sometimes the uvula preserves its increased size, and becomes scirrhus; excision then becomes indispensable. This operation is performed in the same manner as that for the removal of the tonsils.

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## SECTION II.

### *Diseases that have their seat in the substance of the various parts of the Mouth.*

THE mouth is often observed to be affected with phlegmasia which has its seat principally in the cellular tissue. This inflammation appears to have a tendency to affect parts in the immediate neighbourhood of decayed teeth. It sometimes is limited to a portion of the gums, but generally it involves the whole side of the jaw.

The patient, at first, feels a constrained and painful tension in the affected part, which gradually swells and becomes red; great heat soon manifests itself, and the part becomes extremely painful, which is increased by the motions of the jaw.

When the phlegmasia is very extensive, or when it develops itself with great violence, it soon occasions general derangement. Headache, sleeplessness, acceleration of the pulse and other symptoms characteristic of the febrile state, are the result. When the inflammatory symptoms have lasted for some days, the phlegmonous symptoms may gradually decline and the parts return to their natural state. The remedies that tend to favour this termination, are emollient topical applications upon the affected part, and an antiphlogistic regimen. But if the inflammatory symptoms continue to increase, we soon discover, upon the part affected, an augmentation of size and sensibility, accompanied by lancinating pains. A collection of pus will next be formed, which may be detected by feeling the most prominent part of the tumour; this part becoming thin finally bursts to give vent to the matter.

The spontaneous opening of abscesses is generally effected in the interior of the mouth, which occurs between the fourth and seventh day, and sometimes at a much later period.

Such is the general course of phlegmons; but their progress may be caused, by a thousand different circumstances, to vary. Sometimes the disease consists of a pustule upon the gums in



the neighbourhood of a decayed tooth, and develops itself in twenty-four hours; at other times, it consists of a large deposition which disfigures the whole side of the cheek, and suppurates about the expiration of a fortnight. This deposition may occur upon any part of the mouth and throat, as upon the palate, and as far as the inferior parts surrounding the amygdalæ, upon the posterior part of the pharynx, &c.

When phlegmons have acquired a certain size, they impede respiration and deglutition so that it is always proper to open them prematurely. Those that are situated upon the inferior part of the posterior mouth are often very difficult to open. To effect this, a large bistoury with the blade enveloped, as far as the point, with a piece of linen should be used. In this manner the neighboring parts are secured from injury. After the abscess has been opened the head of the patient should be inclined forward, to prevent the matter from getting into the throat. The opening should be large, otherwise it will close, or the contents of the abscess will not be perfectly evacuated and hence the cure will be greatly retarded.

If the abscess be very deep, if it be situated upon the lateral parts or near the base of the larynx, it will be expedient to open it with the pharyngatom.

When phlegmons of the mouth have suppurated they generally cicatrize in a few days; but it sometimes happens, in persons of a feeble constitution, that they produce indurations or ulcerations of a more or less serious character. These indurations or ulcerations being surrounded by the moisture and heat of the mouth, do not fail to produce excrescences of various kinds and often very difficult to cure.

### *Epules.*

Among the excrescences of the mouth the result of ulcerations or other causes, there are none more remarkable than those that affect the gums and which are called epules, or epulides. Those tumours of the gums designated by the same appellation, differ, however, very much in character.

Some are soft, whitish, indolent and of a polypus nature, they vary in size, their base is of different dimensions and in all cases may be removed without injury. They are merely local affections and produce no constitutional impairment.

At other times these tumours are, at first, hard, red, indolent, and of a scirrhus nature. We may then apprehend a change in the nature of disease; in fact they may inflame, become very painful and ulcerate. A cancerous termination of this kind is more to be looked for when the patient is naturally of a bad constitution. The disease is often provoked by the use of various

caustics upon the part when in a scirrhus condition. If these tumours be neglected they will continue to grow, occasion acute suffering and may produce caries of the maxillary bones, the loss of the teeth, &c.

These excrescences should, when in a scirrhus state, be extirpated in the same manner as those which are of a polypus nature. This is effected by seizing the tumour with a pair of forceps and excising it as low down upon its pedicle as possible with a bistoury. The hemorrhage that follows this operation is suppressed by pressure judiciously applied. The operation generally succeeds and the tumour will not return. Should any fungi make their appearance after the operation, they should be destroyed with caustic and in this manner a complete cure will be effected.\* But the like success will not attend such tumours as are painful and have taken on a cancerous nature and are of long standing. Our hopes to affect a cure will in such cases be very limited. We should not however, hesitate to remove them as soon as possible, with a cutting instrument, and endeavour by the resources of medicine to subdue this serious disease. We should be particular to destroy with mild escharotics the first little tumours that may appear. It is only by such remedies and long continued care that we can hope to obtain a complete cure of the affection which is more difficult to remedy in proportion to the age of the subject and the feebleness of his constitution.

#### *Ozena of the Maxillary Sinus.†*

There is also another species of morbid growth that appertains to the diseases of the mouth, it has its seat in the maxillary sinuses, and is called ozena from the fetid odor it emits.

This disease, from its serious nature, from the obscurity of its symptoms in the early stage of the affection, and from the operation it demands, requires to be treated of in detail.

The disease may be produced by a blow upon the malar apophysis. Sometimes it occurs after acute disease, at other times it appears without any appreciable cause.‡ It manifests itself by an acute and deep-seated pain in the substance of the maxillary bone, and sometimes along the alveolar border. In the latter case the disease has been attributed to a decayed molar tooth, which an unscientific dentist will extract, without affording any relief. The intensity of the pain, which continues to increase for some days, soon occasions a febrile condition, but

\* The application of the actual cautery is generally more effectual than caustics.—*Eds.*

† This affection is usually designated by the name of muco-purulent secretion.—*Eds.*

‡ The most frequent cause is dental and alveolar irritation.—*Eds.*

in a short time the pain and fever gradually subside. If the phlegmasia terminates in resolution, a cure will have been effected, but if it suppurates, the sinus will be filled with pus.

The matter contained in the sinus generally discharges itself into the nasal fossæ, through the natural opening, or by the destruction of the osseous and membranous walls which separate these two cavities. The matter having got into the nasal fossæ, may make its way out of the anterior nares, or pass down the throat according to the position of the patient.

The matter is generally very fetid, which probably arises from its constant contact with the air that passes through the nares, and its retention in a warm and humid cavity; circumstances very favourable for the prompt decomposition of this humour.

This acrid and corrosive pus has been frequently known to decay different parts of the walls of the sinus, and in this manner to effect an opening through which it discharges itself. Sometimes the superior walls are destroyed by the pus, which penetrates the cavity of the orbit, becomes infiltrated into the cellular tissue which lines the orbital cavity, and forms a tumour and a fistule between the inferior eyelid and the cheek. At other times the pus affects the anterior part of the sinus, and forms a fistulous tumour upon the cheek. The tumour and fistule, in some cases, are seated upon the gums, and the discharge of pus is often observed to be between the gums and teeth.

These fistulous ulcers are nearly always surrounded by callous flesh; if a probe be introduced into them, it will be discovered that the fistulous canal runs in the direction of the maxillary sinus, and even communicates with this cavity.

M. Jourdain has, in cases of this affection, advised the use of detersives, to be injected through the natural opening of the sinus; but, in addition to the difficulty of injecting the sinus through this opening, we cannot thoroughly empty the contents of the cavity in this way, and the small quantity of pus that remains keeps up a constant irritation.

The most simple and certain way of effecting a cure, is to make an opening into the sinus through the alveolus, or the inferior part of the canine fossa.

When the disease is accompanied with caries of the molares on the affected side, if these teeth should be loosened, or if the pus be discharged between them and the gums, we should extract them, and with a trepan make an opening into the sinus, and cut away the alveoli, so that the opening may be sufficiently large as not to become obstructed in consequence of the swelling that occurs some days after the operation. Should the teeth be sound and firmly situated in their sockets, the opening should be made through the base of the canine fossa.

To perform this operation properly, the patient should be



seated. The operator, standing in front of his patient, draws the commissure of the lips backward, at the same time raising it from the gums. The internal membrane of the mouth, and the parts which unite the cheeks to the maxillary bones, are now to be separated. With a pointed trepan a hole is to be made through the walls of the sinus at the inferior part of the canine fossa; this hole must then be enlarged by means of another trepan with a blunt extremity, which will prevent injury to the opposite walls of the sinus. The parts are then dressed with pledgets of lint placed between the gums and cheek.

When the evils attendant upon the inflammation have subsided, and when suppuration is well established, detersive injections and gargles should be used, recommending to the patient, at the same time, to introduce his finger frequently into the artificial opening, to prevent a premature closing up. The disease will, by this mode of treatment, be generally cured in six weeks.

Some dentists, who have written upon the diseases of the mouth, have described, under the terms, *engorgement* and *dropsy* of the *maxillary sinus*, two diseases which are merely modifications of *ozena* of this cavity.\* We shall now speak of those circumstances which have caused these modifications to be regarded as separate affections.

We remarked that in *ozena* of the sinus, the pus emitted a very fetid odor, and that it became so corrosive as to cause the destruction of the walls of this cavity.

The extreme fetor of the pus appears to be owing to the free entrance of air into the sinus in its passage through the nares; as this fetor is the consequence of the decomposition of the pus, which could not have taken place in so prompt a manner without the presence of oxygen contained in the atmospheric air. This decomposition is also influenced by the health of the patient and the nature of the ulceration which constitutes the disease.

It may occur, that the pus which is formed in the sinus instead of being continually exposed to the contact of air, may be entirely excluded, either by a cyst, or by the complete obstruction of the natural opening. The pus in such cases does not undergo any remarkable decomposition; but as it is retained, it fills the whole interior of the sinus and from this last circumstance it has been called *engorgement of the sinus*. It may be readily seen that this difference is but of little importance. It only renders the disease in its early stage more obscure; but it nevertheless, produces decay of the bones and all the other evils of which we have spoken as attendant upon *ozena*, so that the curative means are in both cases the same.

\* See Jourdain.

When the purulent matter which fills the sinus, instead of commencing to produce denudation and decay of the walls of the sinus, in order to make an outlet for itself, distends this cavity, as we have stated, sometimes happens. The term *dropsy* has been given to this disease. The matter may vary in consistency; but it is always of a purulent nature. The walls of the sinus not being lined with a serous membrane, cannot occasion lymphatic effusion necessary to produce dropsy.

The history of ozena of the maxillary sinus is closely allied to that of polypus of this cavity, which we now propose to examine in detail.

*Polypi or fungi of the Maxillary Sinus.*

This disease is sometimes the result of blows upon the cheek, but generally its cause is unknown. In its early stage a dull pain is felt in the sinus, and very frequently a tumour at this time makes its appearance upon the gums. The disease has been attributed to decayed teeth situated beneath the sinus, and they have been by unscientific dentists, extracted without affording any relief.

When polypus of the sinus has attained a large size, it distends the walls of this cavity in every direction. The cheek becomes elevated, the nostril of the affected side closed, the palatine arch sometimes depressed, the mouth distorted, the teeth on the affected side loosened and may, by the slightest force, be removed. As the disease progresses, the polypus sometimes becomes visible in the nasal fossæ, or in the sockets of such teeth as have been extracted: the malar apophysis becomes considerably elevated, and the maxillary bone disarticulated. The fungus elevates the floor of the orbit and forces the eye out of its socket; it compresses the nasal canal, and produces fistula lacrymalis. When the bones become carious, pustules and abscesses, discharging ichorous matter, are formed in the mouth and upon the cheeks. This disease, as can be readily imagined, is of a very serious character, and our hopes to effect a cure is very slight indeed. If, however, the patient be not nervous, and if he has a good constitution, and should the disease not have made great progress, it may be cured when under the care of a skilful surgeon. There are several cases on record to corroborate my assertion.

To obtain a perfect cure of this disease, it is necessary to make a large opening into the sinus at its most depending part, and through it to destroy the fungus with the actual cautery.

The operation is performed by detaching the cheeks from the maxillary bone, this is done by cutting the lining membrane of the mouth; then, after having denuded the bone of the soft parts which cover it, the inferior part of the sinus is removed with an

instrument of the shape of a pruning knife; the parts which offer great resistance are cut away with a chisel and mallet. It is useless to extract the teeth previous to the operation, for they will be brought away with the portion of the sinus that is excised. The opening thus made will be as large as the base of the sinus. The operation is often followed by profuse hemorrhage; but the cautery, which is used to destroy the fungi, will generally suffice to arrest it.

The cauterizing iron should be heated to a white heat, and having placed the patient in a proper position and protected the neighbouring parts from injury, it should be applied to the fungi and not allowed to remain longer than a second, so as not to produce much pain, and for fear of lighting up great inflammatory action in the surrounding parts.

It will be found necessary to repeat the application of the cautery every five days until the fungus be entirely destroyed, as it possesses a tendency to be reproduced whenever any portions of it are permitted to remain. A gargle of barley water and honey should be used after every application of the cautery.

When the polypus is entirely destroyed, fleshy and red granulations will form at the bottom of sinus; the walls of this cavity will approximate, and the parts will cicatrize, leaving no other deformity than that which arises from the loss of the teeth.

If the polypus be small, it will only be necessary to open the sinus with a perforating trepan, as recommended in cases of *ozena* of this cavity. It should be borne in mind that success greatly depends upon the size of the artificial opening.

*Wounds, Ulcers, Tumours and other Diseases of the structure of the different parts of the Mouth.*

THE LIPS.

*Imperforation of the Mouth.*—Sometimes children are born with their mouths imperforated. It will readily be perceived that this freak of nature will in a few days produce death, if it be not remedied.

To remedy this evil an incision should be made in the place where the opening of the mouth should have been. As the lips, in cases of this kind, generally adhere to the gums, these should be separated with a suitable cutting instrument.

In order to prevent the reunion of the parts, it will be found necessary to place a compress between the lips and the gums, also one between the lips, and a bandage applied to sustain them in position. As the infant will be unable, for a time, to receive the breast, it should be artificially nourished.



*Contraction of the Mouth.*

The cicatrization of the eruptions of small-pox, or of an ulcer, may produce contraction of the mouth by glueing together a part of the borders of the lips, particularly near their commissure. This may be prevented by placing a compress between the lips; but when this union has taken place, the operation, as recommended in case of imperforation of the mouth, becomes necessary.

*Hare-lip.*

Hare-lip consists of a division of the lip. It may be congenital or accidental.

Congenital hare-lip generally occurs in the superior lip; the division may be in the middle or lateral parts of the lip.

When the division of the lip is accidental and has recently occurred a reunion may be attempted, especially if it has been produced by a sharp instrument, or even by a blunt one, if it has not occasioned very great inflammation. Should the inflammation be very great, it will be proper to use such means as will tend to subdue it, and to favour the suppurative process, and when granulations have formed, we can then unite the divided parts.

If we neglect to unite the edges of an accidental division of the lip, the result will be a hare-lip resembling a congenital malformation.

Congenital hare-lip may be single or double; when double it presents two slits separated by a fleshy partition: in order that this partition may be preserved in the operation, it must be at least four or five lines in width near its base, for we are obliged to remove at least a line from each side of it.

The fleshy partition is sometimes too short, we must, in such cases, ascertain if we can make it reach the level of the lip, either by putting it upon the stretch, or by detaching it from the frænum of the lip or jaw; but should it be too short or too narrow, it should be removed, making the incision in the shape of a triangle with the apex upward and the base downward.

Hare-lip is sometimes attended with the prominence of a tooth, or a portion of the alveolus. As this would interfere with the reunion of the lip, or would at least leave a deformity after the operation, it would be advisable first to extract the tooth, or to remove the prominent portion of the alveolar border.

It may also be accompanied by a fissure extending along the palatine arch as far as the soft palate. When the hare-lip is double, there will sometimes be two fissures in the palatine arch. In cases of this kind, the success of an operation is very much diminished, because there is not sufficient hold to sustain the bor-

ders of the divided parts. We can, however, with great care, effect a union of the lip, and we may even hope that the fissure upon the palatine roof will become completely closed up, especially if the child is but a few years old.

The affection under consideration is finally attended with loss of substance from the palatine arch; this disposition is more serious than the preceding. When this loss of substance is not very great, it will still be possible to unite the borders of the opening after the operation; but, in such cases, the superior dental arch, by contracting, no longer preserves its natural relation with the inferior, and the inferior teeth becoming more prominent, close in front of the superior.

Persons having hare-lip are subjected to too great inconveniences not to desire to have the deformity removed; yet we see many persons neglect to have their lip operated on. The deformity creates an unpleasant appearance; it occasions, in children, a difficulty in sucking, and it opposes prehension and mastication of food, in adults, who, while speaking, are constantly spitting and forcing the saliva from their mouths.

This deformity is remedied by uniting the edges of the fissure in the lip. The various means proposed to effect this, merely consist in excoriating or paring off the edges of the fissure.

Some practitioners recommend the edges of the fissure to be pared off with the bistoury, others with a pair of scissors.

The latter method is, perhaps, preferable, because the incision is made more smooth, and can be effected more expeditiously. The objection that has been made to performing the operation with the scissors is, that they bruise the borders of the wound; this will not be the case if the scissors be properly constructed, which should be slightly curved, and have sharp cutting edges.

The operation for hare-lip, in all cases, is performed in the following manner. The patient should be seated, an assistant, standing behind him, supports his head and approximates the commissures of the lips with his hands placed upon the cheeks. The surgeon, having raised the lips from the gums, and having separated them with the bistoury if they adhered, holds, with the thumb and index finger of his left hand, the portion of the left border which he is about to remove, and, with one cut of the scissors, he makes an incision beyond the angle of the hare-lip; he next holds, in like manner, the right portion of the lip and the external side of the place where he will make his incision, and with his scissors makes the second incision, forming an acute angle at the extremity of the first. The hemorrhage, which follows this operation, is generally arrested by the approximation of the edges of the wound, which are kept together by adhesive plaster, or by the united suture, with a proper bandage. The first method of sustaining the edges of the fissure in contact with

each other will not always suffice; the second, though, more painful, is more certain. When, however, either method is had recourse to, a proper bandage will be found very useful; the bandage suggested by M. Louis is generally used. Some practitioners advise only the employment of a bandage; but it is to be feared that, in many cases, this would be insufficient.\*

### *Swelling of the Lips.*

There are persons who have naturally large lips; this occasions no other inconvenience than a difficulty of distinct pronunciation. Sometimes lips assume suddenly a very large size; this swelling, which is not generally painful, yields, in a short time, to the use of tonics.

### *Affection of the Frænum of the Tongue.*

The frænum is sometimes too hard, or is inserted into the tip of the tongue; the tongue then, being restrained, cannot reach the palatine roof, and is constrained in some other of its movements. This slight defect of conformation prevents the child from receiving the breast and from swallowing; it impedes pronunciation and prevents the articulation of certain words, particularly those which contain the letter *t*.

The shortness of the frænum does not, as many suppose, occasion stammering or lisping. This affection of the frænum is much more uncommon than is generally supposed by nurses, and in ten cases which are said to require a division of the frænum, there will scarcely be one which actually demands the operation. Division of the frænum may be easily effected with a pair of blunt-pointed scissors. It is very common for this operation to be performed while the mouth of the child is opened when crying.

Small encysted tumours, or carcinomatous and scirrhus ulcers, which impede mastication, deglutition and pronunciation, are sometimes formed in the substance of the frænum. The only remedy for these is excision.

To effect this an assistant holds open the mouth of the patient by means of a piece of wood introduced between the last molar teeth. The surgeon then seizes the tumour with a pair of forceps or a hook, he then carefully detaches it with a blunt-pointed bistoury.

### *Affections of the Tongue.*

The tongue is not an organ so essentially necessary as to be indispensable to life. Children have been born without tongues, and persons have accidentally lost this organ, and have been, nevertheless, able to swallow with facility, and to pronounce words distinctly.

\* The twisted suture is the one now most commonly employed in the treatment of hare-lip.—Eds.



The tongue is not essential for speech, as many persons suppose. Sound produced by the escape of air expelled from the lungs through the narrow opening of the larynx, supplied with moveable cartilage of the epiglottis, is modified by the various parts of the mouth and nose to constitute words and harmonious sounds. Although the tongue assists, in a great measure, in modulating and accenting sound, its presence, however, is not indispensable to the performance of these phenomena.

The tongue may be amputated without producing any very serious evil. It is known that in Turkey this operation is performed usually as a corporal punishment, and, although amputation is carelessly performed, the hemorrhage and inflammation which follow are not usually attended with serious consequences. It is seldom that this cruel punishment causes death. Persons who have undergone this punishment are frequently known to recover, at the expiration of a longer or shorter time, the use of speech sufficiently to be understood.

The tongue may be cut in a spasmodic motion of the jaws. A person during an epileptic paroxysm pressed his tongue between his teeth so hard that he cut three-fourths of its length and nearly entirely through its thickness; he would have divided it completely had he possessed all his teeth. No means were used to unite the edges of the wounds, yet a reunion was effected in a short time, without leaving any deformity, by the position, and the repose that the patient was induced to take on account of his pain. If we have strong reasons to fear that a reunion will not be spontaneously produced, we should endeavour to facilitate it either by a suture, or by means of the bladder of *Pidrac*. This last mode is preferred because the suture is painful, and it may augment inflammatory symptoms, and may tear the parts.

All simple wounds of the mouth will, in time, heal of themselves, without any assistance of art.

### *Intumescence of the Tongue.*

Swelling or the morbid elongation of the tongue is a very rare disease. It has been witnessed at birth, and in very young infants, but is rarely seen in advanced age.\*

Generally this disease at its commencement scarcely demands notice. The tongue, at that time, merely presents itself upon the borders of the lips; this does not interfere with the functions of the mouth. Should this bad habit be not corrected by forcing the tongue to remain within the cavity of the mouth, it will gradually acquire a larger size; it will afterward hang partly out of the mouth, and occasion a very repulsive appearance. The in-

\* See an excellent dissertation of Professor Lassus on this subject, published in the first vol. *Des Memoires de l'Institut National*.

fant, in this condition, is unable to receive the breast, and will perish if other means be not used to nourish it. Those children who are advanced in age when thus affected, are only able to chew and speak with great difficulty, and the saliva continually flows from their mouths.

When the disease has so far advanced that the tongue fills the interior, and hangs out several finger-breadths from the mouth, its surface will be constantly rough, covered with a thick coat of mucus, and ulcerated in several places. The inferior lip will be depressed anteriorly, and sometimes much increased in size.

If a child be the subject of this stage of the affection, the teeth being continually pressed against by the tongue, are pushed forward, and from their constant exposure to the air do not fail to become injured; so that if the disease of the tongue last for a few years, the teeth will nearly always decay.

We can readily imagine the inconveniences that must result from a considerable enlargement of the tongue. That organ, which descends as low as the base of the chin, causes a continual stream of saliva to flow upon the breast. The patient is almost entirely unable to masticate and to speak.

The subject of so hideous a deformity can only live upon liquids, which he with difficulty swallows.

It has been proposed for this affection to amputate the tumefied part of the tongue,\* this operation has been practised, but modern surgery prescribes means of cure much more rational.

When the disease commences to show itself in a suckling infant, that is, when the tongue only shows itself between the lips, where it constantly remains, we should soon cease giving it the breast, and feed it with a spoon; because the motions in sucking favours the progress of the disease, as the end of the tongue is pressed against the nipple, while in drinking, the child is obliged to make a contrary motion with its tongue. A bandage should also be adopted. The use of a bandage to keep the mouth closed, and only removed when the subject is to receive his food, will suffice to remedy this evil, whether the person be a child or adult.

If the tongue has assumed a certain size it may be reduced by the application of leeches and emollients; it should be then forced into the mouth and there retained by means of a bandage applied over the mouth.

Should the disease have arrived at its worst stage, it still will be susceptible of being cured. Emollient lotions and leeches, blood-letting from the ranine vein and deep scarifications should be resorted to, to effect the disgorgement of the tongue; a mode-

\* *Julii Caesaris Claudini imperica nationalis*—Bononiæ, 1613, lib. iii. ch. 6, page 603.

rate and constant pressure should be exercised upon it either with the bladder of Pidrac, or in any other manner, until it is reduced, and afterward it is to be prevented from hanging out of the mouth as before recommended.

The teeth which have been forced from their proper positions may be regulated by adopting the means that we shall hereafter describe. The inferior lip may also be made to assume its proper form by the constant use of the bandage employed in cases of hare-lip.

### *Doubling over of the Tongue.*

We have frequently heard of doubling over of the tongue, which produces suffocation, spoken of; such tales are told by negroes who have been badly treated, or who wished to avoid a cruel chastisement by stating that they can put an end to themselves voluntarily by swallowing their tongue; but all such accounts are, to say the least, very doubtful.

### *Gun-shot Wounds in the Mouth.*

It sometimes occurs that a person, wishing to commit suicide, discharges the load of a pistol in his mouth; this very often does not produce death, but it can easily be imagined what mischief must result from the discharge of a pistol in this cavity.

Sometimes the inflammation and swelling of the throat are so great, a few days after the wound has been inflicted, that the passage of air may be completely obstructed, and the patient dies from suffocation. In cases of this nature surgical operations, that at first appeared inconceivable, have been attended with happy results.

In case of injury of the trachea and œsophagus from gun-shot wounds, M. Desault, surgeon at the Hotel Dieu in Paris, has passed through the nostrils two large gum elastic tubes, one for the passage of food into the stomach, and the other passes into the windpipe. The patient breathes through one and receives his nourishment through the other by injecting into the stomach with a syringe, soup, cream of rice, and all other nourishing food, in a sufficiently liquid state. The wound, by this method, being no longer irritated by the continual passage of air and of aliment, may be very easily cured.

### *Compound Wounds.*

Wounds of the mouth which do not heal, are such as are accompanied with causes that keep up a constant irritation. These causes are principally the opening of the salivary conduit, decay, constitutional affection, &c.

When the duct of steno is involved in a wound of the mouth,



the saliva which continually flows through it prevents the parts from cicatrizing; there will then remain fistulous ulcers, which can only be cured by first preventing the saliva from flowing through the wound. To accomplish this several compresses are to be applied over the parotid gland, and sustained by bandages, some passing underneath the chin, and others around the head. The gland, by this means, gradually sinks down; it ceases to secrete saliva, and the wound being no longer moistened with this fluid, heals. It often happens, however, that the ulcer which has existed for a long time presents thick and hard edges; these should be destroyed by touching them with some caustic application in order to effect a speedy cure.

After a cure has been obtained there will remain a slight depression upon the part corresponding to the salivary gland. Mastication can be properly performed; digestion will not be found deranged, and the remaining salivary glands will easily supply the functions of the one the action of which has been suspended.

All wounds, complicated with caries of the bone, cannot be cured until after the complete separation of the dead or diseased portion of bone.

In syphilis, when accompanied by all the symptoms attendant upon disease, if it be not arrested in its course by proper treatment, it is not an uncommon circumstance to witness consecutive chancres in the mouth, even accompanied with decay of the palatine arch and the bones of the nose; these generally yield to a mercurial treatment, judiciously administered. It is sometimes seen that the curative means dispel the signs of the disease from the genital organs, and the other symptoms of the affection, as the osteocope pains, &c., but the pain in the mouth will remain unshaken, and will even continue to progress. Under such circumstances it often occurs that the patient is put under another course of mercurial treatment, and even increased by administering large doses for the want of a knowledge of the causes that keep up these chancres in the mouth, when even the syphilitic affection itself has been cured. These symptoms of the disease may remain after the use of the most methodical treatment, either in consequence of the bad condition of the ulcer, or from caries of a portion of the subjacent bone, which is very long in healing. Finally, they may still continue to manifest themselves, and this is most commonly the cause, from the natural weakness of the constitution, which has been greatly increased by the disease and the treatment, and there being no longer sufficient vital energy to allow the economy to make the necessary effort to effect cicatrization of an old ulcer. In cases of this kind the use of tonics, exercise, a visit to the country, and all means which tend to improve the general state of the constitution, are the only remedies that should be resorted to.

## SECTION III.

*Diseases of the Salivary Glands and Conduits, and affections peculiar to the Lymphatic Glands.*

Children frequently have under and upon the sides of their tongues, little tumours of the form of a crest, these are nothing more than prominent sub-lingual glands. It is necessary to be acquainted with this fact in order not to interfere with these little glandular bodies.

Salivary like other glands become inflamed from various causes. Inflammation of these glands may end in any of the modes of termination of inflammation that other parts do. When violent inflammatory action is set up in a salivary gland, when it suppurates, the phlegmon always has its seat in the cellular tissue, that surrounds the gland and unites its lobules; genuine pus is furnished from this tissue alone and not from the substance of the gland proper.

Glandular inflammation terminates by resolution, induration, and even gangrene. Induration of these glands may insensibly diminish and finally disappear; but if it continues for a very long time, the gland will become scirrhus. This scirrhus may as in other parts of the body, remain stationary or it may take on a new action and become cancerous.

Sometimes the salivary glands, in consequence of long continued disease, become atrophied and disappear.

In inflammation of the salivary glands, their secretion of saliva is always more or less suspended; but sometimes the action of these organs is so much excited, that the saliva is continually flowing from the mouth. It is in such cases altered and it is not by chemical analysis, that we should endeavour to discover the nature of its composition.

The secretion of saliva is increased by masticating various acrimonious plants, but there is no substance that increases flow of this fluid more energetically than mercury in the treatment of syphilis when given in very large doses, or when administered to very irritable persons.

Various means, acting in different ways, have been extolled for arresting salivation; among them are camphor, opium, and the various preparations of sulphur; these have no more efficacy than mild purgatives and cooling gargles. Salivation sometimes continues so long and is so violent that every part of the mouth becomes affected; the swollen and softened gums retain in a slight manner, the teeth that are implanted in their sockets, and which sometimes drop out; the walls of the mouth and the surface of the tongue are covered with ulcerations. When saliva-

tion is suspended and the inflammation of the mouth ceases, the use of detergent gargles, and especially those which are acidulated, become very useful; they favor the cicatrization of the ulcers, strengthen the gums, and the teeth soon become firmly fixed in the alveoli. The reiterated use of mercury, however, when carried to the extent of salivation, always effects the teeth, which loose their whiteness and their firm attachment in their alveoli, and are not so capable of being preserved.\*

There are other diseases of the salivary organs, which appertain more especially to the excretory conduits through which the saliva is poured into the different parts of the mouth. When these conduits are involved in a wound of the cheek, the saliva that continually flows through them, prevents the wound from closing, causing it to become fistulous. It is not uncommon for dentists to be consulted in such cases, as the subject thinks that a wound of this kind is prevented by decayed teeth from healing, and it is important that the dentist should know the causes of the disease.

These fistules are generally occasioned by the duct of Steno. The wound contains fungi and callosities, in the middle of which is a narrow opening, often imperceptible, and through which saliva continually flows; but in greater abundance during masticating and speaking. If the internal orifice of the fistule is higher up than the external the saliva runs freely; in contrary cases, this liquid accumulates and forms a tumour the contents of which may be emptied by proper pressure. The internal orifice of the fistule is very near the duct of Steno, or some of its branches, or communicates directly with the parotid gland.

Salivary fistules are cured with caustics and escharotics, which destroy the callus and impart tone to the edges of the ulcer. These remedies should be assisted by a compress, and it is necessary, during the whole course of treatment, for the patient to abstain from chewing and speaking.

Sometimes the saliva produces concretions, which have been known to be sufficiently large to form genuine salivary calculi. The formation of these calculi is often occasioned by the presence of little foreign bodies, introduced in the excretory canals, and around which molecules of calcareous substance are continually collecting. The presence of these calculi prevents the excretion of saliva and occasions foreign depositions.

### *Ranula.*

Among the different diseases of the salivary conduits, there are none more remarkable than that which has been called ranula.

\* The destruction of the alveoli, and loss of the teeth, frequently results from the protracted and excessive use of mercurial medicines.—*Eds.*



This disease consists of a tumour beneath the tongue, formed by a dilation of the excretory duct of the maxillary gland, (the duct of Wharton.) It seldom has its seat in the duct of Steno.

When the tumour first makes its appearance, it is situated upon one of the sides of the frænum of the tongue, the part is then found drier than usual; and as the tumour increases in size, it forces the tongue upward and backward and occasions a prominence below the chin; in this state, it occupies the whole of the base of the mouth, and it becomes difficult to ascertain to which side the diseased duct belongs. Mastication and pronunciation are impeded in consequence of the size of the tumour, which always contains purulent saliva and sometimes calculi; sometimes a crevice is formed in the encysted deposite, and the matter which is discharged from it is extremely fetid.

As this deposition is encysted, to obtain a perfect cure, we must necessarily remove a part of the cyst, to give exit to the matter contained.

The means for obtaining this result are setons, caustics, actual cautery, injections, incision and excision. The last is preferable to the others, which are subject to inconveniences more or less serious, and are not so certain in their effects.

The operation consists in making a crucial incision into the tumour and removing the greatest part of its walls; to effect this, the cyst is held with a hook, and with a bistoury, as much of it as possible is dissected out. If there be much hemorrhage it should be arrested with agaric and with a proper compress. The suppuration that occurs some days after will destroy the remainder of the cyst.

Sometimes very large tumours remain for several years, and entirely prevent the possibility of speaking; in this case, the first benefit derived from an operation is the restoration of speech, as that of the extraction of a cataract is the restoration of sight.

#### *Affections of the Lymphatic Glands which encompass the Jaws.*

The glands in the neighbourhood of the jaws, as the maxillary, parotid and other glands, are more subject to inflammation than are the salivary glands. Inflammation in them terminates in the same manner as that of the salivary glands.

Among the numerous causes that may produce swelling of these glands, the most common one is dentition. This process produces upon the side of the heads of children a very remarkable action, from which arises a series of diseases of a more or less serious character, according to circumstances, and which have received the vague term of strangles: sometimes there will be occasioned peculiar cutaneous affections; at other times ophthalmia or deafness, and often an engorgement of the lymphatic glands in the neighbourhood of the jaws. All these merely indicate great

feebleness, or a great nervous susceptibility. The great degree of action in the jaws, which is necessary for the development of the teeth, is communicated to the neighbouring parts, and disturbs their customary functions. It is in this way, probably, that in the greater number of cases, engorgement which occurs in those glands just mentioned, is occasioned by the process of teething, and not dependent upon a peculiar humour as is generally supposed. It often happens, however, that swelling of the glands near the jaws, in children, is of a scrofulous affection, this is easily detected from the constitutional appearance.

Those who are of a scrofulous diathesis have fine white skin, a ruddy complexion, are fleshy, their teeth are often dark and decayed, their lips large, also the wings of the nose and the eyelids; their jaws are thick, large near their angles, and are subject to cutaneous affections of various kinds. Children of a scrofulous constitution are generally more or less fair or chestnut colour, with blue eyes; their cranium is of a large size, and they are generally remarkably intelligent. This disease usually develops itself at the period of second dentition, at puberty, or after some sickness. When we observe merely these symptoms of scrofulous affection, and it has not developed itself energetically, it may be prevented by the use of tonics, change of air, baths, exercise, a vegetable diet, &c.

If these means are neglected, and even sometimes when they have been used, the disease will develop itself and progress with more or less rapidity, as circumstances may favour it. It first manifests itself by a swelling of the glands of the neck, especially those situated near the angles of the jaw. This swelling, at its commencement, is not attended with pain nor change of colour of the skin that covers it, and it often remains for a long time in this state. As the disease progresses, however, sensibility and pain in the glands are developed; the skin assumes a violet hue, it becomes thin, and a prominent point is formed, which suppurates. The granulous abscess generally opens in several places, which communicate with different little openings of the glands; a viscous serum, mixed with some purulent flakes, is discharged through these little orifices. The orifices remain a long time fistulous, and become covered with fleshy excrescences; sometimes they unite and form an unhealthy ulcer, the borders of which harden, turn over, and have the appearance of being torn.

As suppuration goes on, the glands diminish in size and appear to be insensibly destroyed; when they entirely disappear, the wounds cicatrize, leaving wrinkles and an unseemingly ridge which never becomes effaced.

The disease may affect several glands at the same time or successively. Wounds that have cicatrized will again re-open. Scrofulous affection attacks successively the glands of the neck,

those situated below the clavicle, in the axilla, &c. It frequently shows itself near the different articulations, and especially at the elbow, knee, phalanges and toes; tumours that make their appearance in these various parts often occasion decay of the bone.

This disease may be cured by a proper treatment, or it may spontaneously disappear by some peculiar change in the system, by acute disease, or at the period of puberty, &c.; but if it continues progressing, the pulmonary glands and those of the abdomen will become affected, and occasion consecutive evils which would render the disease altogether incurable.

### *Of Scirrhus and Cancer in the Mouth.*

Inflammation of the salivary and lymphatic glands, and even the white fibrous parts that enter into the formation of the mouth, may terminate in *induration*. This condition sometimes gradually disappears; but it often happens that the part insensibly increases, it becomes circumscribed, assumes a greater degree of firmness, not always accompanied by pain, and is then termed *scirrhus*. Scirrhus tumours may remain stationary for several years, without giving rise to any other inconvenience than that which is occasioned by the presence of a hard body; but it frequently happens after a contusion upon these tumours or from the use of irritating applications, caustics, &c., and sometimes without any appreciable cause, that they inflame and assume a cancerous form. In this case, the tumours at first produce a tickling sensation, which gradually changes into pain more or less acute. The tumour is then observed to be sensitive to the touch, augmented in size and becomes irregular or tuberculous. The subjacent skin takes on a red hue, which becomes gradually brown, and the circumference of the tumour presents varicose veins.

As the disease progresses, the skin is elevated and becomes thin at some parts; it then bursts, and a serous and inodorous humour is transuded. Soon after an eschar is detached that exposes a very malignant ulcer; the pus that is discharged from it is reddish, extremely fetid, and so irritating that it excoriates the neighbouring parts, which it touches. In time the edges of this ulcer are folded down, become hard, irregular, very painful, and often occasion alarming hemorrhage. This cancerous ulcer constantly enlarges by destroying the surrounding parts; the pain it produces becomes so acute, so insupportable that all the functions are deranged by it. Sleep and appetite are lost, fever supervenes, and the patient perishes slowly in a most painful manner. The glands of the breast and of the testicles are the parts most generally subjected to cancerous affection; other parts, however, as the lips and different parts of the walls of the mouth are often affected with this disease.



*Cancerous Tumours of the Lip.*

Cancerous tumours sometimes make their appearance upon the inferior lip. It is at first difficult to distinguish the nature of these little tumours, they are seldom seated upon the superior lip. The disease generally consists of a little pustule covered by a crust, and remains for a long time in this state. The crust drops off and is renewed for a number of times, so that a continued irritation is kept up in the part. A little hard body about this period is observed to form in the substance of the lip. This tubercle at first is moveable, indolent, a little troublesome; but when it has increased in size it becomes painful and ulcerated. The ulcer discharges a reddish, ichorous and very acrid matter; its edges gradually become hard, callous, irregular and very painful. The application of various ointments appears to produce no good effect, and those which contain stimulating substances cause great pain, and brings on a worse condition of the ulcer. Should the disease be left to itself it may destroy gradually a great portion of the lip, and continue to produce fearful ravages.

When the disease is well characterized, the only means of arresting its progress is excision. It should be performed with a bistoury and in such a manner, so as to remove the whole of the diseased part. When the tumour extends very deep into the lip, there may remain a large and deep cavity after the operation; to unite the borders of this cavity the same means that are used to unite the fissure of hare-lip must be resorted to.

If the cancerous tumour has been completely removed, if there be no other part affected with the disease, lastly if the patient be not of a cancerous predisposition it will be completely cured; but if a cancerous diathesis be strongly developed in the patient, or if the cancerous button has not been entirely removed, the cicatrization will not go on, or will soon re-open, and the disease make new progress which will become nearly impossible to arrest.

*Cancer of the Cheek.*

In some rare instances a cancerous tumour makes its appearance upon the cheek; heals up and a short time after again breaks out and remains for a long time in the same condition. If the part be irritated with the finger nail, or the application of stimulating substances, a little ulcer which will not cicatrize, will make its appearance. This ulcer, is of the same nature as the preceding, and is sometimes attributed to the presence of carious teeth. Its progress is slow and constant, its bottom is of a wan color, its edges are hard, turned over and irregular; and an ichorous, fetid, and very acrid humour is discharged from it. If it be communicated from one part to another, the periosteum and the bones will swell, become carious, and all parts of the face become so

deformed, as to present a most hideous appearance. In this state, the disease is incurable, the person is subjected to long and most excruciating suffering; he insensibly grows weaker and weaker, fever supervenes, he loses his usual sleep and appetite, and dies a most miserable death. Cancerous ulcers may also appear upon the palatine arch, the palate, in the nares, &c.

All these constitutional diseases, though they do not strictly come under the province of the surgeon-dentist, appertain nevertheless to the history of the diseases of the mouth, since the different parts of this cavity are liable to the disease. A person who has a correct knowledge of all these disorders may discover them when they first make their appearance in the mouth, and be able to give salutary and always very important advice, while the disease is in its incipient stage and capable of being arrested. The dentist who has some knowledge of medicine, will be aware of the impropriety of performing a serious operation upon an individual, the state of whose health holds out no hope for success, and which would expose the life of the patient and the dignity of the science.

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#### SECTION IV.

##### *Some affections simply nervous, or of a Rheumatic Nature.*

Tooth-ache generally depends upon decay of those organs in which the pain is felt. The pain is then produced by the exposure of the dental nerve in consequence of disease, and which experiences an acute and painful sensation from the contact of acrid sanies that produces decay, from the impression of atmospheric air, heat, cold and other foreign bodies coming in contact with the nerves exposed and in a diseased state. In all these cases of tooth-ache, it is simply an epiphenomena; decay is really the disease; we shall speak of this in another place. It often happens that a person experiences severe tooth-ache, while there is not disease in these organs; it is generally an affection of the white fibrous tissues which form the alveoli and is of a rheumatic nature, as may be discovered by the progress of the pain; in some cases, however, these pains appear to be purely nervous, and are allied to facial neuralgia.

Tooth-ache more frequently attacks persons who have been, or who are still subject to rheumatic and catarrhal affections, those who are subject to diseases of the mouth which has become, in consequence of this, very irritable, than it does others not thus affected.

Sometimes the pain appears to be seated in a single tooth

which the patient points out as the organ affected; if an unlearned dentist extracts it, the tooth is discovered to be sound, and often the pain does not disappear. If however the extraction of the tooth is painful and difficult to effect, the tooth-ache may be suspended for a longer or shorter time, as if by the application of a viscatory to the temples or at the angle of the jaw, or by all other counter irritants; but it would be paying dear to sacrifice a sound tooth to be relieved of pain that is liable to return at any moment.

The pain very often affects the whole of one side of the jaw, and the patient cannot precisely point to the seat of it. It frequently appears to affect different parts; the patient at one time suffers in the superior, at another time in the inferior jaw; sometimes the pain will be felt upon the right, at other times upon the left side of the jaw.

If the pain is very acute, and if it continues very violent for several days, the affection, at first confined to the white fibrous parts of the alveoli, extends itself to the cellular tissue and the mucous membrane that envelopes them. The parts then become swollen and the teeth are loosened and painful to the touch. If these series of phenomena affect a single tooth, its sensibility and its becoming loosened may lead one to suppose that this organ is diseased, and should he not understand the nature of the affection, he will extract a sound tooth which would have regained its former solidity in its socket. In this case the gums may remain fungous and soft for a longer or shorter time, it may sometimes happen that even phlegmons appear upon the part and suppurate at that point.

Tooth-ache of a rheumatic nature, generally attacks adults of strong constitution in cold and wet weather, and who have had frequent diseases of the mouth.

When tooth-ache is subdued very easily, as do all rheumatic affections, it may yield to the most simple remedy. It will be relieved by charms performed with a mysterious air imposed upon the credulity of the patient. It is known that the presence of the dentist is often sufficient to relieve tooth-ache of nervous persons.

It is especially for these species of pains that many dentists, and even the good women, have particular odontalgic elixirs. These liquids are nearly always made of alcoholic tinctures, the action of which often suffices to suspend the pain. Indeed, a drop of the tincture of opium applied to the part by means of a piece of cotton will dispel the pain, which will not fail to return; but often, however, not until after a long lapse of time. Hence, various elixirs, and other means more or less ridiculous, have been extolled for the cure of tooth-ache.



*Tic-Douloureux.*

The history of odontalgia, which is essentially of the same nature of pain that produces chronic rheumatism, naturally follows that of tic-douloureux, both of which appear to be of the same nature and are termed Neuralgia.

This disease appears to have its seat in the nerve of the affected part, or at least in the membranous sheath which envelopes the nervous pulp, for the pain seems to follow the course of the nerve. This convulsive affection may be remittent or intermittent. When intermittent the returns may be regular or irregular, and vary in duration and intensity.

Tics of the face manifest themselves by a convulsive affection of some of the muscles. The involuntary motion which constitutes them is always very inconvenient, and sometimes very painful. It generally attacks the superior lip, thence it extends along the wings of the nose as far as the inferior eyelids. Sometimes it appears upon one side of the mouth. It frequently affects the eyelids and the muscles of the eye.

In some cases the affection appears to be confined to a single part of the face; but when it becomes very violent it may involve the whole side of the head and neck. This nervous affection, from its primitive seat, may be traced to the three principal trunks of the fifth pair of nerves (trifacial) and to their different ramifications.

Facial neuralgia is very rare; it generally attacks feeble and very nervous persons. It often appears to be occasioned by the effects of cold and dampness of a north wind. It often assumes the appearance of catarrhal affections, and accompanies nearly always some symptoms of rheumatism and gout. It is often suspended by paroxysms of those diseases.

Neuralgia of the face has been known to appear after the suppression of hemorrhages or ulcers, eruptive diseases, fistulous ulcers of the gums, &c., and it has been supposed that the humours of these affections were conveyed to the nerves of the face and produced the disease; under this hypothesis originated the following proverb: *Post hoc, ergo propter hoc*. But it is much more reasonable to suppose that an attack of neuralgia has caused these various discharges to cease, and that their suppression is an effect and not a cause of the disease. In some cases, however, the disease appears to have been occasioned by a pricking, tearing or contusion of the nerve, or by the development of a tubercle which exercised a continual pressure upon it.

Facial neuralgia varies very much in its progress; sometimes there will be a pain which lasts scarcely a few seconds, and which disappears and re-appears at a regular period; at other times the

paroxysm lasts for several minutes and returns several times in the course of the day.

The disease frequently returns periodically; thus, the paroxysm which generally comes on about evening lasts for several hours, and returns daily at about the same time. When the pain has its seat in the superior and inferior maxillary nerves, the whole of the inferior part of the face of the affected side is drawn to one side; the secretion of the salivary glands and of the pituitary membrane is very much increased; the patient experiences pain and a return of the neuralgia whenever he attempts to speak or eat.

*Treatment.*—These nervous affections of the face are so obstinate that it has been found necessary to employ all of the most active remedies to subdue them.

The local disease, in its early stage, is generally accompanied with general indisposition; there will be fever and inability to sleep. The dim white-colored tongue portends a deranged condition of the gastric apparatus. In such cases, if we employ energetically the various means capable of overcoming these symptoms of general derangement, we will observe the subsidence of the nervous affection. Thus the application of leeches several times in the neighbourhood of the part affected, an emetic, the constant use of diluents, laxatives, pedeluvia and purgatives, skilfully employed, according to the strength and peculiar state of the patient, have been found to be of great importance.

When the disease has passed through the first stage, and has resisted the first course of treatment, it then assumes a chronic character, and the above remedies oftener exasperate the disease than cure it. It would be proper in this case to use various stimulants, tonics, antispasmodics, &c. As each of these remedies have succeeded with some practitioners, they have been successively recommended; hence, in nervous pains, the return of which is periodical, bark given in large doses and in different ways has often been successful. In other cases these pains have yielded to the use of opium, camphor, ether, musk, &c. either given internally, or, which is better, applied to the affected part. Ice has also been employed in this affection; its application has sometimes relieved the pain for a longer or shorter time; at other times it has removed it entirely, and in some instances it has exasperated the nervous irritation.

Pedeluvia are nearly always advisable as they procure relief; also, moderate exercise, light food, and such as is easily digested.

When none of the above recommended remedies have succeeded, and the disease continues for a long time, it has been advised to send the patient to the hot mineral *watering places*, and success is often obtained, which is attributable as much to the

change of air, the voyage, and the great diversion of the mind, &c. as to the efficacy of the waters.

Depositions sometimes have been known to appear in the neighborhood of the part affected with *tic douloureux*; and when these depositions remain open for any length of time they often effect a cure of the neuralgia. This fact has given rise to the employment of vesicatories, setons, moxa, caustic, and the actual cautery; these sometimes succeed, but they are often useless, and in such cases it is fortunate, indeed, if they do not aggravate the disease.

When the disease is the result of a slight wound or contusion, a cure has sometimes been effected by making a deep incision upon the part primitively wounded, and by keeping up a suppuration.

It would appear that in some of these instances the pain is occasioned by the lacerated or partly divided nerve, and that the pain is removed by completely dividing the nerve.

These cases have induced several noted practitioners to divide the nervous branch, which is the principal seat of the disease, when practicable. The operation has been performed upon the suborbital nerve as it passes out of its canal, by making an incision under the inferior lip, which is detached for this purpose. Notwithstanding the precautions afterwards taken to keep up suppuration for a time by means of irritants, caustics, and even the actual cautery, it sometimes happens that the cure is but momentary. The last class of certain energetic remedies that have been employed in these nervous affections, are the magnet, electricity and galvanism; the use of these physical stimulants has sometimes succeeded, and they may be used with much less inconvenience than the various operations we have just spoken of.



## SECTION V.

### *Diseases of the Jaw Bones.*

THE hard, like the soft parts of the body, are subjected to various diseases, and they present in their progress analogous phenomena.

This identity of phenomena will not astonish us when we reflect that the bones, as well as all the soft organs, present a same general structure. The bones are principally formed of a membranous and reticular tissue in the composition of which nerves and the various species of vessels enter. This vascular tissue, which is truly the living and organic part of the bone, exist in the embryo, and even in the fœtus, whose bones are still soft. The depo-



sition of the phosphate of lime, which is deposited in the cells of this tissue to impart to it its solidity, only modifies these phenomena of organization of which it is susceptible in the various circumstances of health and disease, but does not change its essential nature.

We can be convinced of this fact from a rapid examination of the various affections of the bones, compared with those of the soft parts.

The articular portions of the bones may be displaced in violent and sudden efforts. This displacement occasions in luxations diseases analogous to hernia.

The bones may be broken by a blow, fall, &c., and the fracture, like wounds, presents a series of phenomena which tend to the reunion and consolidation of the divided parts.

It sometimes happens, from a contusion, that the bone being denuded and exposed to the atmosphere becomes necrosed; the living part, contiguous to that which is deprived of life, takes on a new mode of action, which separates the dead portion from it. The exfoliation of bone presents a series of phenomena resembling the eschar of the soft parts.

When the whole of a bone is dead, another bone is formed around it, in the middle of which the old bone is sequestered and becomes a foreign body. The necrosis in this respect differs from *grangrene*.

In consequence of blows, falls, and certain constitutional affections, the bones, also the periosteum that covers them, may swell and produce tumours of various consistencies, and hence it can be seen that various bony tumours may correspond to the different scirrhus tumours to which the soft parts are liable.

In fine, these osseous tumours after remaining for a longer or shorter time in the same condition, may take on a new action and experience a peculiar affection which tends to the destruction of the substance proper of the bone; here we again see that decay may present phenomena resembling that of cancer.

We shall speak of these different modes of alteration limiting ourselves to the phenomena which they present in the maxillary bones, and more especially in the teeth.

### *Luxation.*

Luxation is applied to the displacement or the change of relation which occurs to the articular surfaces of the bones. These displacements may be produced by blows, falls, and all violent motions.

In order to understand well the mechanism of luxation of the maxillary bone, it will be proper to recall to mind the action of the muscles which serve to move this bone, the disposition of its

articular surfaces, and that of the bones which surround the articulation of the jaw.

The maxilla can only be luxated in front; when the displacement occurs, the condyle glides over the transverse eminence into the zygomatic fossa.

Luxation cannot occur posteriorly; not on account of the obstacle that the anterior wall of the auditory foramen presents, but because the chin cannot be sufficiently elevated to give rise to this displacement.

The maxillary bone cannot be displaced inwardly; first, because there is no muscular action which can act with sufficient power, in that direction, to produce lateral motions of the jaw capable of resulting in luxation; secondly, all exterior power, violently applied against the branches of the maxillary bone, would fracture sooner than displace them.

The maxilla is only luxated in adults and old men; there are no examples of displacement of the jaw in children, though they frequently open their mouths very wide. We account for this from the difference that exists between the form of the branches of the jaws of infants when compared with those of adults. The neck of the condyles and of the branches of the jaws of infants form a great angle with the body of the bone; while in adults they form nearly a right angle; it can be conceived, from this, that, in order that luxation may take place in young subjects, it would be necessary for the jaw to be carried almost perpendicularly downward. In the ordinary motion of depressing the jaw, the displacement of the condyles is very slight in children, while it is very considerable in old men.

Luxation of the jaw generally occurs in yawning; it may also be produced by the introduction of a very large body into the mouth, when carried very far back between the last molares, in such cases it is perceived that luxation is the effect of muscular action. It may also be produced by external violence, such as a blow upon the body of the bone and which tends strongly to depress it; but generally, violent blows oftener fracture the bone than luxate it.

Luxation of the jaw may be detected by the following signs: the mouth, after an excessive depression of the maxillary bone, remains open, which it is at first impossible to close, the person experiences a very great difficulty in pronouncing certain words, the saliva flows involuntarily from the mouth, an elevation is observed anterior to the ear and a depression near the temple, accompanied by pain at this part in consequence of pressure upon the deep temporal and masseter nerves. We should also observe that when the luxation has occurred upon both sides at the same time, the prognosis is much more manifested; the chin, in such a

case, is very prominent, and is not turned to one side, as when luxation has happened to one side only.

Notwithstanding the numerous signs that characterize this accident, it frequently happens that it is not discovered and that the luxation has not been reduced. The patient then becoming accustomed to this condition of his jaw, and by continued and repeated exertions he is able to close his mouth and to perform the different movements of mastication, though with great difficulty.

Having now pointed out the signs by which we can ascertain if the jaw be luxated, we shall now speak of the manner in which this luxation is produced, when it occurs spontaneously, simply by the muscular action; and point out the muscles that force the condyles out of their articular cavity. Upon these points anatomists differ very much in opinion.

Monro, whose opinion has been generally adopted, explains this phenomenon in the following manner; when the mouth is opened, the condyles of the jaw are carried upon the transverse temporal apophyses; the coronoid apophyses pass under the malar eminence and press upon the inferior parts of these apophyses. When the masseter and internal pterygoid muscles are found behind the new point of support which is always the centre of motion; if, in this state of things, these muscles are put in action, they carry the condyles in the zygomatic fossa, and the action of the temporal muscle remains inactive, since the coronoid apophysis has become the centre of motion.

This explanation is incorrect upon one point, it is that the coronoid apophysis does not rest upon the malar eminence in luxation; for we feel it in the base of the cheek, under the zygomatic arch.

Doctor Pinel (*Journal of Medicine*) established the centre of motion, by which the jaw is elevated and depressed in the articulation of the condyle with the temporal bone, around a transverse line which would pass from one branch of the jaw to the other; so that the masseter muscle falls perpendicularly upon that line. This being established, we perceive that when the inferior jaw is depressed, the masseter changes its direction, and a portion of its fibres approaches more or less the centre of motion. The masseter then, instead of carrying the chin upward and the condyle backward, forces the condyle forward into the zygomatic fossa, and the chin downward.

Boyer, an anatomist, thinks that luxation of the jaw is owing to a change of direction of the pterygoid and masseter muscles, in relation to the direction of the body of the bone. When the mouth is closed the fibres of the masseter and pterygoid muscles form, with the line of direction of the body of the bone, almost a right angle, and these muscles act with all their power; but in



proportion as the chin is depressed, the direction of these muscles assume an oblique position in regard to the body of the bone, and then the power is divided; thus, one part acts in a parallel, and the other in an oblique direction. The first acts with a force in proportion to the depression of the jaw, and finally depresses the chin, elevating, at the same time, the condyle.

All of these explanations, which at first sight appear to differ, are, however, the same as to their principle. In each of them we discover that the ordinary motion of the elevation of the jaw is performed by means of a lever, the muscular power of which is in the middle; but as this lever changes when the jaw is very much depressed, then the condyle is carried so far forward that it takes its fulcrum between the resistance and a part of the power; in this condition the posterior part of the fibres of the masseter and pterygoid muscles, and also the temporal, cannot contract, on account of their great obliquity, so that luxation is favored, since the chin is depressed and the condyle has passed forward.

In order to reduce luxation of the jaw, the patient should be placed upon a low seat, and an assistant should hold his head firmly against his breast. The surgeon now introduces his thumbs, enveloped in a piece of linen cloth, as far back into the mouth as he can possibly upon the last molares; he places his fingers under the chin, and draws the jaw downward and backward, until he perceives that the condyles are disengaged, and then he elevates the chin, being careful to remove his thumbs from between the teeth to prevent them from being bit by the spasmodic contraction of the jaw.

We will generally succeed in reducing luxation of the jaw, when the accident has recently occurred, by the mode of procedure just pointed out; but should we make several vain attempts at reducing it, we must resort to another method, which we shall now describe. The patient being seated as before recommended, the surgeon places between the last molar teeth a lever of a wedge shape; a bandage is then put under the chin, which an assistant draws very tight; thus, a lever of the first class is made which is proper for the reduction of the jaw. When the resistance of the muscles is very great we must overcome it by a slow and continued force until reduction is effected. It will be perceived that when only one side of the jaw is dislocated the wedge should be placed upon that side only.

We will know when the dislocation is reduced by the noise that the condyles make on re-entering the glenoid cavity of the temporal bone, and by the disappearance of all the signs which characterize the displacement of the maxillary bone.

In order to sustain the jaw in its place after it has been reduced,

it will be proper to apply under the chin a bandage, and to recommend the patient to support his chin with his hands whenever he opens his mouth very wide, either in yawning, or for any other purpose. These precautions will be the more essential when the jaw has been easily reduced, because, in such cases, it is more liable to be again displaced.

When we have not been able to reduce dislocation of the jaw either in consequence of its long standing or from any other cause, the patient is obliged to remain in that condition, this does not, as is stated by Hippocrates, produce death; on the contrary, he gradually recovers the ability of closing his mouth, and is even able to chew, though always with difficulty. A more or less prominence of the chin remains in such cases.

### *Fracture of the Inferior Jaw.*

The term fracture is given to all solutions of continuity of a bone suddenly produced. The bones are generally fractured by exterior bodies, which act very violently against them; they may also be fractured by muscular action. The exterior bodies which produce fracture of bones act by their bulk or by their swiftness; when they act by their bulk, they oftener produce a kind of crush than true fracture. But when small bodies are thrown with great velocity they may produce fracture of the bone which they come in contact with, not, as is often said, because they force the parts to *bend beyond their malleableness*, but because the bones being struck so quick that they have not time to yield, and are compelled to break.

Fractures vary according to the kind and the part of bone that is fractured, the direction of the fracture, and various other circumstances which accompany them.

The superior maxillary may be fractured in various ways, but fractures of this bone do not generally displace it, and require no dressing. They will be cured by keeping the part quiet; for this purpose the patient should be careful to make no exertion in masticating.

Sometimes the alveolar border is so much fractured that a part of it is almost detached from the jaw; it then becomes necessary to reduce it, and to maintain it in position by means of a gold or silver ligature fastened to the neighboring teeth.

The inferior maxilla is often protected from being fractured on account of its form, position and motion. The body, the branches and the neck of this bone are liable to this accident.

In these fractures we notice a displacement of the parts, which varies according to the thickness of the bone. As fracture of the branches of the jaw is generally transverse the parts will be very slightly displaced. If the fracture occupy the neck of this

bone nearly the whole of the jaw will remain in its proper position, but the condyle is carried a little forward. Sometimes the body of the bone is fractured upon both sides, the part then which is in the middle will be drawn downward and backward; there will be great displacement, and a great difficulty to maintain the parts in their proper positions will be encountered.

To assure ourselves of the existence of a fracture of the maxillary bone, when there is no displacement to manifest the accident and the part fractured, we should pass the finger along the jaw, commencing under the chin; it will also be necessary to examine, with the fingers introduced into the mouth, the whole of the internal side of the jaw-bone. If these means do not succeed, we should place the thumbs upon the internal side of the jaw, at a proper distance from each other, and the fingers under the chin; and if, moving the parts, crepitation be produced, the existence of a fracture will be established.

Fractures of the jaw are often accompanied with a slight contusion of the soft parts; and when this happens, it will be necessary, after the fracture is reduced, to maintain the fractured extremities in apposition until a re-union takes place. Sometimes the skin and muscles are lacerated and suppurate, and require to be suitably dressed every day. The opening of the wound is often continued for a long time, by the exfoliation of spiculæ or portions of dead bone. When the dental nerve is separated, insensibility of the whole of the parts to which it is distributed will be the result.

Compound fractures of the jaw, like those of other parts, are as various as are the causes that produce them, and are determined by the age and constitutional disposition of the subject; they are more serious when produced by fire-arms than when they are the result of a blow or fall, and their treatment is as difficult as is their prognosis.

Fractures of the maxillary bone, for their reduction, require the same general means that other bones do. Thus, they are to be reduced, maintained in position for a proper length of time after they have been reduced, the evils that accompany them are to be subdued, and those that might develop themselves are to be guarded against. In order to reduce a fracture of the inferior jaw, it will be necessary to apply it against the superior jaw, and then maintain it by means of a double or single chin bandage, as we may have occasion to apply it on one or both sides.

Since it is necessary that the jaws should remain closed during the time that the re-union of the parts is going on, it is observed that the patient is compelled, during all this time, not to take solid aliment; hence liquids are given him by means of a sucking bottle, the spout of which is introduced through the space made by the absence of a tooth. If the patient has not lost any of his



teeth, it will be necessary to extract one of them; but generally the cause that produces the fracture displaces one or more of the teeth.

Having hastily pointed out the peculiarities that fractures of the maxillary bones present, and the means ordinarily employed for their reduction, it will be proper to notice the peculiarities of the phenomena in the re-union of the extremities of the fractured parts: the history of the efforts of the economy, which produces the formation of callus, naturally leads to the disease of the tissue proper of the bones.

When a bone is recently fractured, the rupture of its vascular tissue causes inflammation analogous to that which appears on the borders of a fresh wound; and that inflammation causes, as it does in a wound, a series of phenomena which results in the restoration of the solution of continuity.

The pain resulting from the laceration of the vascular tissue of the bone and the neighbouring soft parts, is sometime so severe as to occasion general derangement and fever. After the subsidence of the symptoms which result from the fracture, the fractured extremities should be held in exact apposition, by means of suitable appliances, until they unite. During the process of union, a swelling will be observed, about the eighth or tenth day, which continues and this will indicate the precise point of the fracture.

From examinations of fractures in dead subjects, at different periods after the accident, the following observations upon the process of consolidation have been made: during the first few days, the fractured ends pour out a bloody liquor, which insensibly becomes serous and is absorbed. A short time after this, the fragments become soft, swell and appear to be covered with a soft reddish substance; this substance, which is contained at the two fractured extremities, assumes a soft cartilaginous consistency, and finally becomes osseous, by forming a pad which obstructs the cavity of long bones and surrounds them externally. We evidently see, in all of that series of phenomena, a perfect analogy between the consolidation of a fracture and the re-union of a wound which is effected without suppuration.

Fractures may unite without a retentive bandage, and even without perfect quietness, as is frequently seen in the lower classes of animals; but we observe that the callus is larger and much more deformed than when the re-union is effected without an exact reduction, and there will always be a considerable shortening of the parts.

When it happens that a fracture does not become consolidated, either on account of the distance of the extremities of the bone, or from disease; we then observe the formation of a cartilaginous cicatrix upon the two fractured extremities, and that the two

extremities are united by a kind of ligamentous production which produces a species of articulation.

*Diseases of the tissue of the Bones.*

The tissue proper of the bones of the jaws, the same as that of the teeth, is liable to the different modes of alteration that the bones in general are, and which we now purpose to treat of.

*Mortification, or Necrosis.*

Mortification of a bone may attack the exterior lama, or extend through the entire thickness of the bone; in both cases we observe a series of phenomena differing very much from each other.

*Partial and external Mortification, or Exfoliation.*

When the jaw-bone, in consequence of a blow, has been denuded of its periosteum, and left exposed, it generally happens that more or less of the surface of the exposed bone becomes necrosed and is detached, sometimes in thin lamæ, at other times in very thick ones. The process by which a dead portion is separated from the living bone is called exfoliation. The time necessary for the production of exfoliation of bone, is generally in proportion to the size of the part exfoliated. This process operates more promptly in young subjects, in whom all the operations of the economy are in an active state, than it does in weak, sick, or very old persons.

Exfoliation is executed at the point where the part affected with necrosis is separated from the living portion, and is the effect of the living portion of bone: this process is generally slow; during the whole time that it is going on, the wound does not heal and the bone remains denuded, or if the parts cicatrize it is only to re-open in a very short time, and to leave at least some fistulous openings, through which, by means of a stylet, we perceive the denuded bone; the suppuration always remains sanious and in a bad condition. When the dead osseous lama is entirely free and is discovered to be moveable upon the rest of the bone, we should endeavour to remove it. The lama of bone is often detached in pieces which are removed with a pair of dressing forceps; at other times, it is separated from the living bone in a single piece, and we are obliged to enlarge the wound to allow it room to be taken out. If we neglect this operation, another abscess will be formed, through the opening of which portions of bone, which have become foreign bodies, will be exfoliated. When the osseous lama, which has become black and eroded, is removed, we discover that the surface of the bone which it covered, presents fleshy granulations of a vermillion red colour; healthy suppuration will then be soon established, and the wound will cicatrize.

In order to prevent exfoliation of bone, means which have always proved fruitless, have been recommended; and when exfoliation has appeared to be a necessary result, it has then been advised to adopt various topical applications, or to perform certain operations; thus, alcoholic tinctures and escharotics; trepaning the diseased bone and even the application of the actual cautery have been recommended; but all of these nearly always fail, and are often injurious. It would be much better in such cases to wait the result of the efforts of nature, than to provoke it by remedies which only tend to interfere with the natural course of the phenomena.

If the disease be produced by a constitutional affection, as syphilis, it would be necessary to employ internal treatment to arrest its progress.

We shall describe the progress of necrosis when it is evidently produced by the denudation of the bone and its long exposure to the air; but that disease may be the effect of several other causes which tend to detach the periosteum of the body of the bone. Hence it may be occasioned by a violent blow, it is sometimes produced by an abscess, and it may finally be developed spontaneously during some constitutional affections, as in syphilis, cancer, scurvy, &c. In other respects necrosis is oftener developed in the hard and compact parts of the bone than in thin spongy portions, or their articulations.

In all cases, in which necrosis appears upon the surface of the bone, as it necessarily occurs in the bones of the jaw, it is always the periosteum which is principally affected. That membrane inflames, swells, detaches itself from the bone, and being thus suddenly deprived of its accustomed nourishment, a greater or less extent of its surface and thickness becomes dead.

To understand well the different modes of necrosis, we should recollect, that the bones are vascular organs in which life is kept up by the communication between the vessels proper and those of the periosteum and of the medullary tissue in the long bones, whence it results that life may be partly or totally cut off, when the sources by which it is conveyed is disturbed.

We have given the history of partial necroses which takes place in the exterior of a bone, when from some cause the periosteum is more or less detached from it; but there are cases, though very rare, in which partial necroses occur in the interior of a long bone and involves more or less of the internal lamæ.

#### *Partial and Internal Necrosis.*

This disease is difficult to discover at its commencement; it is sometimes the result of a jolt or concussion, but it is more frequently produced by constitutional causes; in all of these cases



necrosis is owing to an alteration of the medullary tissue and to its decomposition. The patient at first experiences in the part a dull pain, which insensibly increases, and after a longer or shorter lapse of time, sometimes several years, the disease becomes complicated, the part necrosed which remains in the interior of the bone, becomes a source of continual irritation which produces disease through the whole thickness of the bone. The bone now swells and becomes altered throughout its whole tissue, depositions which do not suppurate are formed and they occasion fistulous openings, some of which communicate with the internal cavity of the bone. The long suffering gradually destroys the health of the patient; he becomes troubled with fever, and successively with derangement in all the functions of the system and finally dies after years of suffering.

On dissection the bones are found swollen, irregular and diseased throughout their whole tissue: the interior of the bone contains a necrosed lama, this is sometimes disengaged in the interior of the cavity of the bone, but oftener it adheres to the bone. It is obvious that this is always a very serious disease

#### *Total Necrosis of the Body of the Bone.*

When a bone is found dead throughout its whole thickness, as may happen in the middle of long bones, and sometimes in the body of the jaw, a very extraordinary series of phenomena will be the result.

Necrosis of this kind is commonly the consequence of a violent contusion, which has produced inflammation of periosteum and even of the medullary tissue, capable of decomposing those parts together with the bone itself. The disease may also be produced by a constitutional affection; and it sometimes occurs without any appreciable cause.

This disease is generally difficult to discover in its commencement. The patient feels vague pains in the part affected, accompanied with a kind of very troublesome numbness; abscesses afterwards make their appearance, these sometimes terminate in resolution and sometimes in suppuration. After a long lapse of time, the pains increase, the bones swell and become irregular and rough, and abscesses which form at this stage of the disease produce fistulous openings, the borders of which become hard, callous and curled over, and discharge a sanious and reddish pus. The diseased bone sometimes becomes so fragile that it is fractured by the slightest cause.

After a long lapse of time, several years, for instance, we discover, by introducing a stylet into the fistulous openings, that it traverses the thickness of the solid part, and that it penetrates the centre of the bone, and then meets with a dry and often moveable

part of the bone. If the disease be left to itself, it sometimes occurs that one of the openings enlarges considerably and gives passage to portions of black and porous bone. When all the osseous fragments have escaped, the fistulous ulcers gradually cicatrize and the disease is cured, leaving a deformity in the part. Generally the disease does not spontaneously attain such a termination; the fistulous ulcers, being kept open by the presence of necrosed bone, which is unable to free itself, remain fistulous, the patient becomes exhausted by long suffering;—he finally expires in a kind of adynamic fever, or in a state of consumption.

From an examination of the diseased part after death, we discover a new bone, which is formed by irregular layers around the old bone, which is enclosed in it. We observe that the openings of the fistulous ulcers correspond to holes situated in the new bone, and these holes reach to the sequestra.

This disease generally attacks the bones of the extremities; there are, however, some cases of necrosis of the jaw. In all cases the disease never attacks the articular extremities, but is always confined to the body of the bone. When this affection is discovered we should not wait until the strength of the patient is exhausted to extract the necrosed bone, without which a cure cannot take place.

Before performing this operation we satisfy ourselves, by means of a sound, if the bone be completely sequestered and moveable in the centre of the new bone; we then enlarge one of the openings of the new bone with a chisel and mallet, and remove the sequestra. After all foreign bodies have been removed from the interior of the new bone, cicatrization will go on gradually, all of the fistulous openings will in time close up, and the patient will be cured; a deformity in the part will, however, remain.

From what we have said of necrosis, or the death of a bone, it appears evident that the affection presents a great many varieties; that it is, nevertheless, possible to class them under three principal forms.

In the first form, which may attack the bones of the jaw, as it may all other parts, the disease consists of the mortification of an external lama of bone, varying in extent of surface and depth, and which becomes separated from the rest of the bone by the process of exfoliation.

In the second form, which only attacks long bones, the osseous lama, affected with necrosis, is situated in the interior of the bone, and cannot separate itself. The constant presence of this foreign body in the cavity, produces disease of the whole body of the bone, which swells, becomes the seat of depositions that suppurate, and remain fistulous. Sometimes decay will be produced, and an opening sufficiently large to allow the necrosed part to escape will be formed, and a cure will in this manner be effected.

In the third form the whole thickness of the body of the bone is necrosed, then the deposition of calcareous phosphate, which is continually going on for the increase and maintenance of the part, still continues to be deposited, and accumulates irregularly around the old bone to such an extent as to form a new bone capable of supplying the place of the old one. Necrosis that thus affects the whole of the jaw between the two condyles is found enclosed in the new bone, which has some openings sometimes large enough for the discharge of the sequestra. This form of necrosis presents in its organization the only example of parts capable of regeneration.

### *Osseous Tumours.*

The relations that exist between the hard parts of which we have spoken and the various affections of the soft parts have already been pointed out. This analogy is little astonishing when we are aware that these various organs are all essentially formed by tissues of vessels. The same resemblance too will be found in the diseases of the bones which we are now about to describe. The bones may, in consequence of exterior lesion or constitutional disease, be attacked by a kind of phlegmasia or peculiar irritation, tending to alter their organic structure by increasing their volume and density.

When the jaw, or any other bone has been violently struck, it frequently happens that the periosteum, and some of the external lama of the osseous substance, swells and forms a tumour of greater or less size. Sometimes this tumour will not be prominent, but will cover a great extent of surface; it is then supposed to be the result of the swelling of the periosteum, and is called periostitis, but it is very probable that, in this case, the exterior lamæ of the bone also contributes to the formation of the tumour.

When the swelling of the bone is slight, and when it appears to be a thickening of the periosteum and external osseous layers, it is susceptible of being cured; but when the tumour has acquired a certain size, such a termination cannot be expected; it is to be hoped, however, that it will remain in that condition without making further progress.

In some rare cases the whole thickness of the bone takes on a new action, and increases in size by undergoing a change in its density.

The phosphate of lime sometimes accumulates in the cells of the bone and gives to it the consistency of ivory, and are called *ivory exostosis*.

At other times the density of the bone is diminished; the osseous layers separate and become soft; when this happens they bend and become deformed, as in case of rachitis. In some



cases the bone acquires a considerable size, and then the disease is called *spina ventosa*. Finally, by the progress of these various affections the calcareous salt may be entirely decomposed and absorbed; the tumour then assumes a fleshy consistency, and is called *osteo sarcoma*.

This last disease is very analogous to caries. It is necessary to enter into some detail in describing the cause and progress of these different affections. The causes that produce exostosis are numerous. Sometimes the disease is occasioned by a violent percussion; at other times it is developed in the course of a constitutional disease, such as syphilis, scrofula, rheumatism and gout; in some cases the swelling of the bone occurs without any appreciable cause.

All bones are liable to exostosis. This disease generally only affects a part of the flat and long bones, but it often attacks the whole thickness of the short bones. In general, exostosis, which assumes great consistency, is developed in the compact substance of the bone, while that which is soft occurs in the spongy part of bones.

When exostoses are produced by a contusion, they will only affect the part contused; but should they be owing to a constitutional disease, they may appear upon several bones at the same time. Finally, certain affections of the bones have been known to become general, and manifest themselves simultaneously in all the osseous tissues.

Sometimes exostoses will be very slow in their progress, they will remain nearly stationary, and their only inconvenience is their size and the deformity which they produce; at other times the disease makes rapid progress, impede by their presence important functions, and are accompanied with acute pain which increases sometimes during the night.

Osseous tumours may be developed somewhat in the same manner that tumours of the soft parts are; they are susceptible of resolution and induration. The peculiar softening of the tumours in osteo-sarcoma and caries, is analogous to that which happens to scirrhus tumours when becoming cancerous.

Exostosis which is occasioned by external causes, are not generally dangerous, when they only attack the superficial and smallest part of the long bones and when they do not cover a great space; they are then accompanied with pain, are very hard, but they are likewise very obstinate and do not yield to any treatment. Exostosis having the appearance of ivory is also developed in the compact substance of the bones; it has also been observed upon the jaw-bone in the middle of several long bones and upon the bones of the cranium.

Osseous tumours are more serious when they are seated upon

the extremities of the bones, and when produced by a violent concussion in the articulation, because the continued movement causes the diseases to progress. When the articular surfaces have acquired a certain size, it is desirable that ankylosis would occur, but if the tumour continues to be painful, depositions will occur, afterward caries, and the disease will end fatally. All of these evils have been known to be seated in the articulation of the jaw.

Exostoses arising from constitutional diseases present very remarkable differences. Those which are occasioned by syphilis, appear in the middle of some long bones; their progress may be arrested by proper mercurial treatment, and the tumours very often disappear of themselves, especially if they have not acquired a large size.

Exostosis which is sometimes accompanied by chronic rheumatism, generally makes its appearance upon the same parts as it does when it proceeds from syphilis, and it is often attributed to this latter disease. It can always be ascertained from which of the above diseases exostosis has been produced; thus, when it arises from a rheumatic affection, this affection will necessarily accompany it; it will not yield or will return after the mercurial treatment, and often disappear spontaneously. It is not uncommon to see exostosis to correspond or alter with the varying pains of the gums and teeth without there being any disease in these parts.

Osseous tumours which generally make their appearance near the small articulations of the hands and feet in chronic gout, are produced by an accumulation of calcarious phosphate of these parts. At first they are small and often disappear of themselves, but they in time may become large and stationary. In other respects the treatment of the disease is as difficult as that which produced it.

Exostoses which are produced by scrofula and rachitis are generally very serious, because they nearly always appear upon the spongy parts of the bones; hence they appear upon the short bone or upon the extremities of the long bones; in this case the bones by becoming tumefied, are softened, deformed and are very often affected with caries. The local disease becomes more difficult to arrest as the general disease is the more serious which has occasioned. In rachitis the bones of the jaw and teeth often undergo a remarkable derangement; when that disease has made great progress in children, the lower jaw will be imperfectly developed, and remain short; the teeth of first dentition then decay, and sometimes the germs of the second are discoloured in the sockets.

In some very rare cases, an osseous tumour, of an extraordinary size, will appear upon the extremity of a long bone, and which has been called *spina ventosa*.

The disease often commences, without any appreciable cause, by a deep pain along the bone. At the expiration of a period, very often long, the pain increases and affects the extremity of the bone, which gradually swells. The tumour appears hard, and is insensible to the touch. As the disease progresses, the skin which covers the tumour bursts at its most prominent part, and produces an ulcer from which sanies is discharged.

If the disease be not arrested at its commencement, by suitable means, it will make slow and constant progress; the tumour will sometimes acquire a large size, and the patient will ultimately sink under it. After death, we will discover that the interior of the tumour is formed of a soft substance resembling flesh; its circumference presents a thin osseous layer, compact and containing numerous little holes in both surfaces.

It is generally thought that this thin osseous layer is occasioned by the swelling and extension of the osseous lama, which would seem improbable when the tumour is very large. But it is more likely that, in this disease, the osseous substance is entirely destroyed, and that the calcareous phosphate, which is no longer secreted in the bone, spreads itself in the tumour irregularly, and gives rise to a solid structure.

From what we have said upon the nature, the progress and causes of the various osseous tumours, it will be perceived that the local remedies will scarcely have any effect upon them. When exostosis is small, it may spontaneously disappear, if the parts be kept quiet, if it be the result of a contusion; or it will yield to proper constitutional treatment, if it has resulted from any general disease. If the tumour be very large, if it involves a great portion of the thickness of the bone, it will not be susceptible of cure; and it is to be desired in such cases, as it sometimes does, that it will remain stationary. Under all circumstances, we should only apply surgical means when the tumour, from its size or position, impedes the exercise of some important vital functions; because the operation by which the tumour may be removed is always accompanied with consequences more or less dangerous and often fatal.

The different kinds of osseous tumours, and especially those which affect the spongy part of bones, after remaining stationary for a longer or shorter time, are susceptible of taking on a new action, in consequence of being irritated; they will then become painful, soften, and gradually assume the consistency of cartilage, afterward that of flesh. In this state, ulcers will form around the tumour, and discharge a serous, acrid and fetid pus. Should the disease be left to itself it will necessarily produce death, by subjecting the patient to a series of cancerous affections, the progress of which is such, that they can only be arrested by amputating



the part affected. It is evident that that disease which has been called *osteosarcoma* may attack bones which enter into the formation of the mouth, as well as that of other parts.

Osteosarcoma is not always a consecutive affection of osseous tumours, it often occurs idiopathically, and it then constitutes a disease analogous to caries, of which we now propose to speak.

### *Caries.*

Caries may affect all bones, but it generally attacks the spongy bones, or the spongy parts of the bones. It most generally develops itself in consequence of a constitutional disease, such as syphilis, scrofula or cancer; it may, however, be occasioned by exterior lesion, in persons who have very bad health.

The disease generally announces itself by a dull pain in the parts where caries is about being developed. The pain lasts for a longer or shorter time, after which one or more little phlegmons form; these suppurate and become fistulous ulcers. The ulcers are soon surrounded by soft, fungous flesh, and discharge sanies which leaves black stains upon the dressings. It was for a long time thought that this species of sanies was an infallible sign of caries; but it is now known that it may present itself in cases where there is no disease of the bone, but merely exfoliation of tendinous parts; while caries may exist without giving to the pus the property of blacking the dressings and instruments.

We can assure ourselves of the presence of decay of bone by an assemblage of phenomena and especially by certain signs which are always present; thus, by introducing a stylet into the fistulous opening, we evidently discover that the bone is denuded and porous. If the bone be exposed, either from the removal of an eschar, or by incisions, it will be black, spongy and rough; if it be pressed, a greasy and thick humour will be exuded through all the pores, and appears to saturate all the lamæ of the bone.

When the disease is permitted, to take its course, the bone will be destroyed in the same manner as it is in cancerous affection; the disease at the same time spreads itself and involves the neighbouring bones. The disease generally makes more rapid progress in the spongy than it does in the compact substance of the bones.

It is very seldom that caries is arrested spontaneously; and it is necessary to confine it, by a proper surgical operation, to the part affected; the most certain means to effect this is the application of the actual cautery, which instantly disorganizes the whole of the decayed part of the bone and converts it into a dry eschar, which exfoliates and the soft parts will then cicatrize.

All of the bones of the mouth may, from blows, gunshot wounds, &c. become carious; but decay of these parts is most

commonly the result of syphilis, in which case, consecutive chancres that gradually enlarge and finally expose the diseased bone make their appearance upon the part affected. When the syphilitic affection is not arrested by a proper treatment, decay of the bones will sometimes make such rapid progress that a great part of the palate may be destroyed. Decay has been known to attack, at the same time, the nasal bones, and to destroy the whole of the surrounding parts; the face then presents a deep hole, which communicates with the interior of the mouth. If the disease be then arrested, the deformity may be corrected by false pieces.

If I have devoted some time to the explanation of the diseases of the bones, it is because they are closely connected to those organs to which this work is particularly devoted. Desiring to have a knowledge of every thing which may throw some light upon the affections of the teeth, I have thought it necessary to examine the progress of the various diseases of the bones of which they form a part, and it is in this manner that I have collected sufficient information to present separately the history of disease peculiar to the teeth.

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## SECTION VI.

### *Disease of the Teeth.*

THE teeth, in a state of health and beauty, are of a beautiful milk-white colour in children and adults; but as they advance in age, they become tarnished and assume an ashy or yellowish colour. There are some persons who preserve these organs in a state of health and beauty through life.

The whiteness of the teeth appears to be owing, in a great measure, to the polish of their enamel. It is indeed observed that the yellowish or blackish hue of the teeth is often dependent upon a species of very fine tartar, which adheres to the little inequalities that cover the enamel surface of the teeth; so that it is only with the greatest attention to cleanliness that we can then prevent them from assuming a disagreeable colour. When the enamel of the teeth has a handsome polish, the tartar can scarcely adhere to it; the continual friction of the teeth, during mastication, is a means which tends to clean them. Mastication is so essential for the preservation of the whiteness of the teeth, that as soon as we abstain from it, these organs assume a dark hue and become covered with tartar, as always happens when, in consequence of tooth-ache, we chew on only one side of the jaws. In scorbutic affections, the gums swell, and the teeth become loose in their alveoli; they then cannot be used in mastication, and soon lose their whiteness. In adynamic fevers, various causes tend to

blacken these organs; these causes are the defect of mastication the bad quality of the saliva, and the fetid exhalations which continually arise from the stomach, which does not perform its functions, and even from the lungs. The kind of aliment which is eaten may also change the colour of the teeth; these organs are always of a blackish colour in persons who are in the habit of smoking or chewing tobacco, &c. The yellow colour of the teeth does not, however, always depend upon these various causes: sometimes it is the natural colour of the outer layer of the enamel, so that only the file can give them a lighter colour; but this operation sometimes makes them liable to premature disease, so that, when the teeth are not naturally handsome, it is better to preserve them in that condition, than alter them in order to impart to them a handsomer appearance. The enamel is to the teeth what the cover is to porcelain, it not only serves as an ornament, but also to preserve them.

We shall point out, in the third part of this work, the means necessary for the preservation of the teeth, and those remedies that are injurious to them.

### *The Formation of Tartar.*

The teeth are liable to become covered with tartar; that substance appears to be secreted by the gums,\* especially in persons who have these parts pale or of a livid red colour, soft and constantly bathed in viscid and abundant saliva.

This substance amasses itself upon the teeth particularly during the night. At first, it is deposited in the form of a whitish slime, which adheres to the crowns of the teeth. If this slime be not removed, it hardens and soon becomes as hard as the teeth. Layer after layer of this substance is thus formed, until it causes the gums to recede and the teeth to become loose. This substance is sometimes so abundant that it completely envelopes the teeth. We have seen, in the first part of this work, that a deposition of this kind, found upon a corpse, has led persons to suppose that the teeth of the individual were formed of one solid piece, because the tartar then has a polish resembling that of bones; but generally, tartar collects upon the teeth in an irregular mass, and may accumulate in so great quantities as to form very large prominences upon the teeth. It will be readily perceived that constant cleanliness, and brushing the teeth with suitable dentifrices, are the proper means of preventing its formation.

\* Tartar, or more properly salivary calculus, is not, as M. Gariot supposes, secreted by the gums, but is a salivary deposit. For an explanation of the manner of the formation of this substance, the reader is referred to T. Bell's and other late works on the diseases of the teeth.—*Eds.*



Persons whose teeth are most subject to the accumulation of tartar, are those who are of a pituitary or catarrhal constitution;\* when they neglect to prevent its accumulation, and when this substance is permitted to collect for several years, the teeth become so accustomed to this covering that we often cannot remove it suddenly, especially during cold and damp weather, without producing tooth-ache and inflammation in the gums. In these cases we should choose warm and dry weather to remove the tartar gradually, and when the teeth are completely free from it, we may then, with proper care, prevent it from again collecting.

### *Denudation of the Teeth.*

The friction of the teeth against each other causes them to wear away in a very remarkable manner. We can discover changes in the form of the teeth, and in the exercise of their functions, at different periods of life. About the seventh year of age, the deciduous teeth are subject to great alteration, although they have never exercised great force in mastication. The cutting edges of the incisores are thick, and the grinding surfaces of the molares are worn smooth.

But that destruction is still more remarkable at the roots, which disappear entirely, as is seen in the deciduous teeth, which drop out of themselves. Denudation and destruction of the permanent teeth are not less observable, though they occur more slowly.

The incisores are, at first, generally denticulated upon their cutting edges, the cuspidati and molares are furnished with tubercles or points. The rough edges of the incisores are soon discovered to disappear; they become blunt, and are gradually worn away in the direction in which they articulate with one another; thus the superior incisores are bevelled from behind forward, while the contrary is the case in the inferior incisores. When the inferior close anterior to the superior teeth, the direction in which the wearing away of these teeth takes place is reversed. At the same time that the incisores are becoming denuded, we observe that the points of the cuspidati and the tubercles of the bicuspidates and molares are very sensibly worn down. Thus the teeth sensibly diminish in length, and often appear very short in old age, when the gums have not receded from them.

\* Salivary calculus accumulates on the teeth of some persons in much larger quantities than it does on those of others. The amount seems to be determined by the temperament and state of the constitutional health of the individual, and it varies as much in consistency and colour as it does in quantity. For a fuller description of this earthy deposit, see Delabarre's "Traite de la Seconde Dentition," and a "Dissertation," read before the American Society of Dental Surgeons, "concerning the Physical Characteristics of the Human Teeth and Gums, the Salivary Calculus, &c. &c."—*Eds.*

If, during these different periods, we examine the roots of the teeth, we discover that they diminish in the same proportion that the crowns do, so that in old age they fall out, as the deciduous teeth do at the seventh year of age, deprived of nearly the whole of their roots. There is, however, this difference in these two sets of teeth; at the period of second dentition the alveolar cavities contain the permanent teeth, whereas in old age these cavities become obstructed.

Several circumstances may cause a variation in the mode in which the teeth are worn away; thus the incisores wear away much sooner when the molar teeth are lost, than when these teeth have been preserved; the same occurs when we masticate on only one side of the jaws. Teeth which are not used in masticating scarcely experience any change, as may be seen in those teeth which have no antagonists. Some persons are affected, during sleep, with a kind of convulsive affection in the muscles of the jaw, so that the teeth are cracked by rubbing against one another, and are worn down very soon. It has been recommended, to counteract the effect of this spasmodic friction, to place a gold plate between the molar teeth.

### *Luxation of the Teeth.*

One or more teeth may be luxated, either from a blow or fall upon the jaw. When this happens, it will suffice to replace them and maintain them in their proper places, so that they may, in time, regain their former firmness.

Many practitioners say that when a tooth has been luxated, it ceases to enjoy vitality, because its nerve has been ruptured. They think that the teeth are then retained in their sockets by adhering to the gums, as an artificial tooth which they may have inserted immediately after the extraction of a decayed one. But that opinion appears to me to be incorrect; for, whenever a tooth has not been entirely taken out of its socket, there remains a communication of vessels and nerves between it and other parts, it still has life, and may, by replacing it and abstaining from using it, become tight again in the same manner as other organs do.

It is upon that erroneous opinion that dentists base an operation which is often followed with success, the reason of which it is necessary to explain. When a sound or decayed tooth occasions acute and constant pain, and it is desirable to preserve it for sake of appearance, the dentist will sometimes luxate it and afterward replace it; generally, this will dispel the pain, and the relief thus obtained has been attributed to the rupture of the nerve, which produces death of the tooth. It is easy to conceive that a sudden displacement, accompanied by the laceration of several parts, produces a strong counter irritant, and that an acute pain causes all

other pains of less intensity to cease, without the tooth being deprived of vitality.

When it occurs that the pain is not entirely subdued by luxation, or when it returns a short time after, they then think that the operation has not been well performed, and consequently the nerve has not been entirely ruptured. But by a correct knowledge of the natural progress of organic phenomena, we know that divided parts are not necessarily deprived of life when they cease to be in apposition with one another; and as long as they preserve a slight adherence, if it be but by a single point, they are capable of uniting and regaining their former firmness, enjoying, as they did before, all the properties of life, both in a healthy or diseased condition.

### *Fracture of the Teeth.*

Teeth, when much decayed, are often fractured in consequence of their inability of bearing the force that they are to sustain. If the root be sound, if it has not occasioned any pain, it may remain for a long time surmounted by an artificial crown. When the surface of the root presents asperities, these should be removed with a file; when there is a cavity in the middle, it should be filled with metal, in the manner hereafter to be described. But if the root be productive of acute pain, inflammation, depositions, &c. these symptoms should be subdued by the extraction of the root, or, if possible, by the actual cautery.

Sound teeth may also become fractured from various accidents, either from hard bodies in mastication, or external violence. These fractures may only affect the crown, or be contained along the root; finally, the tooth may be cracked or fractured or split, loosening the fractured parts. When but a part of the crown of a tooth is fractured, the remainder of the tooth should be preserved, and we have had teeth thus treated remain as long as the other teeth. There is no doubt, however, that a tooth which is naturally disposed to be affected with caries will sooner become diseased when fractured.

In fractures of that kind, when one of the fragments is entirely separated, a re-union will never take place; but when the fracture is longitudinal or oblique, and when the two fractured parts still adhere to the gums and periosteum of the socket, they are still under the influence of vital action and are susceptible of a re-union.

Whatever the generality of dentists may say upon this subject, it is certain that some simple fractures of the teeth are susceptible of a complete consolidation, which is effected by means of callus.\*

\* We are compelled to differ with M. Gariot, with regard to the recuperative powers of dental bone; inasmuch as all observation and experience go to establish the fact that it is not endowed with this attribute.—*Eds.*



Simple fractures of the teeth only require the attention that is necessary for all other solutions of continuity of hard parts: it is essential to reduce the fractured parts if they be displaced, to maintain them in contact with each other; time and rest will then favour the development of the phenomena which are to produce a re-union. The fractured parts are retained in position by means of a silken or metallic ligature placed around the tooth and attached to the adjoining teeth.

If the tooth be broken, if there remain points which irritate the neighbouring parts, if it produces pain, inflammation, phlegmons, &c. we cannot then hope for a union, and the only remedy would be to extract the tooth, or to put it in such a condition so as not to produce any of the above evils.

### *Caries of the Teeth.*

It is remarked that the organic tissue of the teeth is scarcely subject to any affection but caries; it does not experience real exfoliation, it is not exposed to necrosis, properly so called, and seldom appears to be attacked with those swellings or tumours which constitute the various kinds of exostoses. There are, however, some instances when they undergo a kind of softening. As to caries which attacks the teeth, its progress is peculiar in these organs.

It is easy to see that the disease termed erosion in the majority of dental works, is nothing more than caries. It makes its appearance, generally, in rachitis and scorbutic affections. If the teeth, during those affections, are tender, if they have not attained their entire development, if they be not entirely covered with enamel, lastly, if their crowns be not wholly through the gums, they may be attacked with erosion. This disease manifests itself in little points or yellow or black holes which cover the surface of the teeth. Sometimes these little holes or depressions reach the osseous structure of the teeth, having pierced the thickness of the enamel.

This disease is developed especially in rachitis, and is only an extension of the general affection of the bones, which even manifests itself upon the teeth. These organs are more readily affected with this disease when they are far advanced in their development.

The deciduous teeth, in consequence of rachitis, are sometimes softened, and are affected with caries as soon as they make their appearance through the gums. The teeth of second dentition, in some circumstances, while they are enclosed in their alveoli, become tarnished, dried up, and are never developed; the jaw then remains short, as it is arrested in its growth.

Caries or erosion may also manifest itself in the teeth of children of a scorbutic diathesis, and in all cases of consumption, during which disease their various parts undergo a gradual wasting.

This disease of the teeth scarcely requires any local treatment, the general affection which has produced it, requires our especial attention. When we, by care, diet, and proper medicines, have arrested the progress of scrofula in children, we have reason to hope that the teeth of second dentition will be properly developed, and will not be affected by that disease.

The causes of caries are constitutional or local; the former depend upon a weak, catarrhal constitution, an unhealthy condition of the gastric apparatus, and some constitutional affections; the latter are the result of aphthæ, inflammation of the gums, odontalgia, the various lesions of the teeth, a crowded state of these organs, the vitiated condition of the saliva, the nature of the aliment, &c.\*

Decay generally commences upon the molar teeth. It, at first, consists in a little yellow spot, which afterwards blackens and produces pain; this spot gradually extends, the pain becomes more acute, and the tooth is readily affected by heat, cold, and acids.

The teeth generally commence to decay at the points which are contiguous to one another, and we frequently see several of them decayed in this manner, so that it is desirable to have them separated from one another. It has been observed that when a molar tooth is decayed, the corresponding tooth on the opposite side of the jaw will be decayed in the same manner and at the same time. This important observation shows that there are cases in which the affection of a part will soon be communicated to the corresponding part on the opposite side.

It is possible, however, that the decay might, in such cases, depend upon a nervous derangement, seated in the fillets of nerves upon both sides. The decay of a tooth also appears to communicate the same disease to the corresponding organ in the opposite jaw, with which it is constantly in contact.

It is singular to observe that as the crown of a tooth is destroyed by decay, the root often diminishes in the same proportion, without its having been affected with this disease, so that when the crown is entirely destroyed, there will be nothing left of the roots but some isolated fragments of about a line in depth.

Caries often commences in the middle of the crown of the molares, and by its progress leaves a large hollow cavity in the interior of the tooth. Sometimes in the decayed tooth only a

\* Caries is *always* the result of chemical action upon the organ.—Eds.

small lateral opening is visible externally, which leads to a large one in the interior of the organ.

The molares generally become decayed before the incisores and cuspidati, the disease in these last nearly always commences at the points that are contiguous to the adjoining teeth.

Various remedies have been recommended to arrest this disease. The first care to be taken, when the teeth present a black spot at the part where it is in contact with the neighboring organ, is to separate them with a file, applying the file so as to remove the decayed part. This operation often puts a stop to the disease. When the disease has produced a cavity in the substance of the tooth, it will then make rapid progress, which is favored by the contact of air, saliva, &c. these causes may be prevented from acting upon the diseased part, by filling the cavity with gold, silver or lead.

The actual cautery, heated to a white heat and applied to the decayed part, is recommended to relieve the pain and to arrest the progress of the disease, because it is thought that this remedy is capable of completely destroying the nervous action of that osseous organ. This remedy does often relieve the pain, and would seem to arrest the progress of the decay; but the tooth is never entirely dead, since it remains contiguous to the neighboring parts. The decay continues to destroy the tooth slowly; and at the expiration of a longer or shorter time, the tooth may still occasion pain. When the decay has made great progress and frequently occasions pain, it would be better to extract the tooth.



## PART THIRD.

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### HYGIENE AND THERAPEUTICS.

HAVING given a description of the parts which enter into the formation of the mouth; having endeavoured to point out the particular use of each of these parts, also their general functions in the performance of mastication and pronunciation; having given the history of the various diseases to which these different parts of the mouth are subjected, we now propose to examine and point out the hygienic and medicinal remedies that should be employed; the one to preserve these parts in a healthy condition, the other to remedy the various diseases to which they are liable.

The means made use of to preserve the health and to cure the diseases of the mouth are required at three epochs of life, during which they are especially necessary.

The first period is during the eruption of the milk teeth; the second is during the eruption of the permanent teeth; the third is during the remainder of life.

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#### SECTION I.

##### *The Eruption of the Teeth of First Dentition.*

THE difficulty that the deciduous teeth experience in making their appearance through the gums, in a great number of children who reside in cities, depends generally upon the feebleness of of their constitution and their more or less nervous temperament.

The teeth of a strong and healthy child are readily cut, and do not occasion the slightest derangement in the system; they make their appearance at the proper time, and it often happens that their eruption is effected previous to the usual period. Dentition, in weak children, and such as are of a nervous susceptibility, who generally have delicate parents, is often attended with great diffi-

culty, and it may produce evils which may put the life of the child in jeopardy.

The eruption of the deciduous teeth, which is not generally announced by any symptoms in healthy children, is very remarkable in others by a series of very extraordinary symptoms; these are either seated upon the gums, in the digestive apparatus, or in the nervous system.

*The condition of the Gums during the eruption of the Deciduous Teeth.*

We observe, during the period of the eruption of the deciduous teeth, that the gums of sickly children are swollen and assume a very red hue, the saliva is secreted in great quantities, and is constantly flowing from the mouth. The child then experiences a painful sensation in the gums, which induces it to put its fingers constantly in its mouth, and to bite every thing which it may have in its hands. It has been asserted that the difficulty which the teeth experience in rising from the alveoli depends upon the resistance of the gums, hence attention has been directed to means calculated to soften the gums and to enable them to give an easy exit to the teeth. But that opinion is altogether erroneous; the evils which arise at the period of first dentition are not occasioned by that cause; they are produced by the difficulty that the organism experiences in effecting the development of the germs, and the great nervous irritation in these parts. It is, in fact, observed that, when the germs of the teeth are easily developed, the gums appear to open of themselves, to give a free passage to the teeth.

It can be easily imagined from the foregoing remarks, what reliance can be placed in the use of corals and other hard bodies designed to soften the gums; all these are, to say the least of them, useless, and are often productive of serious consequences. Thus, a nervous child laboring under dentition, is induced to rub his gums; should a hard substance be then placed in his hands he irritates the parts with it and may increase the nervous irritation which it was designed to allay. If the use of the coral does not increase irritation in the gums, it is more calculated to harden than to soften the parts by the constant friction.

*The means capable of opposing the Derangement of the Gastric Apparatus during first dentition.*

The germs of the teeth during the first six months of infancy which are then concealed in the alveoli, increase very gradually, but at the period of their eruption, their growth is very rapid. The jaws are forced to yield to the development of the teeth, they

undergo a change in their form, dilate and enlarge very suddenly, especially near the alveolar border, so that the whole apparatus of mastication becomes a point of remarkable action during the whole period of the eruption of the teeth.

It is probably from the eruption and the shedding of the teeth that such a predominant vital action is produced, during the period of infancy about the head, either by the excess of heat of the head, the rapid growth of the hair during health, or by the various phlegmasiæ during sickness, which attack the glands or the cellular tissue in the neighborhood of the jaws, in the mouth and upon the skin, covering the head and face.

Generally the irritation of the mouth during first dentition extends itself along the alimentary canal, and produces derangement in the functions of the digestive apparatus. The secretion of saliva is much increased, loses partly its digestive properties, and becomes very irritating, as do all secretions in an unhealthy state. The food when mixed with this saliva does not properly undergo the first change necessary for digestion, it passes into the stomach which is itself irritated by nervous sympathy, and consequently not well calculated for good digestion. The alimentary substances which thus preserve their crude state, are conveyed into the intestines which in consequence becomes irritated, and the food merely passes through without affording nourishment.

Children whose digestive apparatus is deranged by first dentition, are attacked with frequent vomiting, a constant diarrhœa, and have a dislike for all kinds of aliment, and a ravenous appetite alternately.

If the digestive apparatus remains for a long time in a deranged state, the child gradually grows weak, and he loses the strength and energy necessary to effect the development of the teeth, so that the cause of the disease is prolonged by the effect which it has produced. The child is in this way often kept in a consumptive state, which finally terminates fatally.

It will be conceived that it is more easy to prevent, or arrest, in the incipient stage, the disorders of the digestive apparatus occasioned by the eruption of the teeth, than to remedy them when they have been of long standing.

The best means generally, of facilitating the eruption of the teeth is by keeping the digestive apparatus in a healthy condition. This, in a great measure, is dependent upon the manner in which the child is nourished.

In order that children may have a good and robust constitution, it is important that their food should be given in moderate quantities. An excess of nourishment, by overcharging the stomach, weakens and disposes it to frequent and varied derange-



ments; there will arise less inconvenience from giving a child a small quantity of nourishment than from overloading its stomach with food, for nourishment does not depend so much upon the quantity of food taken into the stomach, as upon the proper manner of its being prepared for digestion. Upon this important point of the physical education of children, maternal solicitude is often in error. Very often slight colics, pain in the gums and sometimes merely drowsiness, occasions the child to cry, the mother then not being mindful of the numerous causes which may occasion this fretfulness, endeavours to quiet the child by giving it the breast, this being repeated whenever the child cries, he will then become both a fretful and gluttonous child.

The mother from the continual crying of the child, very soon thinks that her milk is not sufficiently nourishing, she now endeavours to make up for this deficiency by giving it soups, very often improperly made, and scarcely ever congenial to the feebleness of the child. Such diet produces humoral plethora which manifests itself in various parts, especially about the head.

The diet of children should be given in moderate quantities, and time should always be allowed for the food to be well digested before more is given. Without this latter precaution there will be found no chyle which serves for the maintenance and the development of the parts by imparting to the whole organism the degree of strength and energy of which it is capable of.

As dentition depends upon the health of the system generally, it is important to neglect nothing which may contribute to that end; hence it will be proper to exercise the child according to its age and strength, and it should sleep well during the night.

It should be borne in mind that children very easily contract habits which become more difficult to correct, the longer they are indulged in them; a child who has been awakened several times in the night successively, in consequence of a disease, may continue to wake at about the same hour after the disease has been removed, and if he is taken up and given the breast every time he awakens, it will become a habit from which it will be very difficult to wean him.

If health is important for an easy eruption of the teeth, we cannot insist too much upon the means necessary to obtain it. The mother who is so very solicitous for her child, and who cannot hear him cry without giving something to appease him, does not contribute the most towards his health: but she, who directs his physical education in a regular manner, and who does not deviate from her usual course by every little occurrence, promotes the health of her infant.

By adopting these simple and easy rules we assist nature in

developing an original good constitution, and in correcting an unhealthy one.

In this manner are diminished the number and serious nature of the diseases which attack childhood, among which the evils produced by teething, are not the least formidable.

Should we not be able to prevent the derangements of the intestinal canal, which generally manifest themselves during first dentition, we should endeavour, as much as possible, to relieve them. If the diarrhœa be moderate, if the matter evacuated be yellow and a little fetid, it should not be arrested; this symptom generally continues during the most vigorous efforts made by the teeth in coming through the gums, and is afterwards arrested spontaneously. But when the diarrhœa is very active, the evacuations green, slimy, or mucous, emits an extremely insipid or fetid odor, we should use every endeavour to relieve those symptoms of disease; for this purpose, we may advantageously give several doses of ipecacuanha, mucilaginous drinks and weak cordials. As the treatment of this disease comes more properly under the province of the medical practitioner, we shall not give a detail account of its treatment.

*The manner of treating Convulsions produced by Dentition.*

During the eruption of the deciduous teeth, there are some children who appear to be in a continual state of spasms, these are indicated by a kind of general irritation and frequent tremors of the limbs. If the pain of the gums during dentition be very great, several slight convulsions will supervene. Very weak children may be so often attacked with convulsions, and the paroxysm of each convulsion may continue so long that its death is the result.

Children who appear to be the most subject to this affection are those who are offsprings of weak, nervous and sickly parents. They have a delicate constitution, they are generally very restless while asleep, and are startled by the least motion or noise. This original disposition is often aggravated by a great number of circumstances dependant upon their mode of education, and which tend to keep up the extreme sensibility of the patient.

As children of this temperament are generally offsprings of wealthy persons, they are mostly nursed in such a manner that their predisposition to convulsions is generally more likely to be increased than diminished.

A child of a delicate and nervous constitution should not be nourished by its mother when she is weak, very nervous, very gay or very irascible, but it should be placed under the care of a nurse residing in the country, who, together with the other neces-

sary qualities of a good nurse, should be very kind, and be rather more serious than lively.

The constant influence of a woman of this character, would soon subdue the irritability of the child.

When a child has inherited from weak and nervous parents a delicate constitution, and a predisposition to convulsive affections, it would not be proper for it to be nourished with its mother's milk, for this would tend to increase that disposition. We cannot deny that the quality of the milk partakes much of the peculiar constitution of the nurse. The milk of a nurse who lives regularly, who possess soft manners, and is engaged in labor adapted to her constitution, is always sweet, and is always the same. The milk on the contrary, of one who lives luxuriously, who eats an abundance of acrimonious and stimulating substances, who has very strong passions, and who continually remains in idleness, furnishes milk which easily undergoes a change in quality; the least physical derangement, or the slightest moral affection changes the regular mode of secretion of this fluid, and renders it irritating. Children have been known to be attacked with severe colics, a short time after their nurse had eaten too much, or when they had labored under any moral affection, as anger, &c.

If the precautions pointed out by us, have not been adopted to destroy the predisposition to convulsions, all means should be employed to prevent these affections which are likely to show themselves at the period of first dentition.

These means do not consist in the use of necklaces, amber and amulets of various kinds, accredited by ignorance and credulity; but are contained in the treatment based upon hygienic principles, and a good physical education. Thus frequent exercise in the open air, bathing every day in water of a temperature regulated by the state of the atmosphere are indicated. The food of the child should be in sufficient quantities, regular, but not too abundant. It would also be advantageous to accustom it to be moderately clad and to have its head uncovered, being careful to avoid extremes into which those mothers fall, who leave their children almost naked during cold weather. The custom of leaving the arms of a child bare as high as the shoulders in cold weather, may produce serious consequence, especially if the child be of a catarrhal constitution.

Some parents allow their affection for their children to carry them to such extremes that they seldom do what is deemed the most advantageous for their health. If a physician informs a mother that too much clothing renders a child liable to take cold more easily, she will then leave her child almost naked. Another physician who sees the evil consequences of so outrageous a



practice, advise proper clothing, the child will then be smothered with wearing apparel and bed clothes. There is in all things a medium that should be observed.

If we be unable to correct a highly nervous constitution, or to prevent convulsions, which may be brought on during the eruption of the deciduous teeth, it will be necessary for us to discover the remedies best calculated to arrest the effect of these affections.

Among the various means proposed for the cure of convulsions in children, there are none possessing greater efficacy than the application of leeches to the angles of the jaws. Local bleeding is always calculated to diminish all nervous excitement.

Those substances which are looked upon as the most powerful anti-spasmodic, such as opium, musk, camphor, &c. are certainly very energetic stimulants, capable of preventing convulsions by their counter action upon the nervous system, but in order that they may act beneficially, they should be given before the paroxysms, more for the purpose of preventing the return of convulsions than to arrest them during their attack.

We shall not enlarge upon the remedies proper to subdue convulsions, as they come properly under the province of the physician.

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## SECTION II.

### *The manner of directing Second Dentition.*

A well arranged denture is much more important than is generally supposed, for teeth badly arranged impair pronunciation and mastication, and are not very firmly placed in their sockets, because their roots are sometimes partly out of their alveoli. An irregular set of teeth does not exhibit that arrangement which a regular denture does where these organs mutually sustain one another, and where the jaws shut properly, which latter circumstance is very important for the preservation of the teeth. Irregular teeth are very difficult to be kept clean, they do not resist the various diseases of the mouth as much as regular arranged organs do, and their preservation is of shorter duration. These circumstances together with the unseemly appearance of a deformed denture, should induce persons having children under their charge to examine their mouths often, so as to correct any defect in the arrangement of the teeth. We might at first be induced to believe that this attention is useless, since the teeth of country people generally arrange themselves properly, and remain very white and very sound without the assistance of art. But it should also be observed that generally the constitutions of country persons are such that the effort of the economy is

sufficient of itself to perform all of its operations, while it becomes necessary to assist her whenever she appears not to possess proper energy. Moreover we frequently meet even among country persons with badly arranged dentures, in consequence of some trifling neglect. The effort of the organism always acts more favorable when assisted than when left to itself.

The eruption of the permanent teeth is in children residing in cities very often attended with great pain, and requires constant attention. The eruption of these teeth often produces the same evils that are the result of first dentition. Diarrhœa and even convulsions often supervene during the eruption of the permanent teeth, but generally these diseases do not occur as often, and are not as fatal as when they attack children in their first and second years of age, at which period the organism has not acquired a sufficient force to resist these derangements. The evils attendant upon second are to be treated as those occurring during first dentition, which have been treated of in the preceding chapter.

The deciduous teeth should be removed previous to the eruption of permanantes, the former often remain very firm in their sockets, and prevent by their presence the permanent teeth from arranging themselves in their proper positions. The milk teeth, however, should not be extracted too early, for they favor the development of the jaws; hence they should be allowed to remain as long as they are not an obstacle to the eruption of the permanent teeth, but when they are loose and the permanantes are about piercing the gums they should be extracted.

It should be remembered that the permanent are much larger than the deciduous teeth, as they have on their first appearance through the gums attained their full size. It is also ascertained that at the period in which the teeth are shed, the jaws have not their full growth, especially near the alveolar border.

From the foregoing observations it will be perceived that the permanent do not occupy the precise place of the deciduous teeth, but are a little to one side of the place occupied by the latter; so that the presence of the deciduous teeth, without preventing the eruption of the permanantes, may cause them to assume an irregular direction. The permanent being larger than the deciduous teeth, are necessarily very much crowded, and with difficulty arrange themselves upon the alveolar border, which at the time of the eruption of these teeth, has not received its full size. In proportion as the maxillary bones increase in size, the roots of the teeth are developed, and these organs are then provided with more space in the maxillæ.

Should we neglect to extract the milk teeth, and to employ

other measures capable of favoring a good arrangement of the permanent teeth, deformities, often very serious, and always much easier to prevent than to remedy, may be the result.

I however repeat, that the milk teeth should not be removed too early, especially when not decayed, loosened, or when they are not an obstacle to the eruption of the permanantes, and when they do not cause these to deviate from their proper places; because their presence contributes to the development of the alveolar border, which is one of the most essential conditions for the regular arrangement of the permanent teeth.

Neither should we regard a slight deviation of the permanent teeth, dependent upon a defect of position; because we daily see that these teeth become regular as the alveolar border enlarges; hence we should avoid unnecessary meddling with them, as they will, in time, regulate themselves.

The extraction of the deciduous teeth, at the period of second dentition, is very easily accomplished, as they are then devoid of roots, and are, for the most part, very loose; a ligature will often be sufficient for this purpose. When these teeth are firmly retained in their sockets, a small hawk's-bill forceps may be used to remove them. If the deciduous teeth have not been removed at the proper time, they will remain in the mouth for a considerable length of time, and appear to be retained by the permanent teeth which are situated on each side of them; some effort will then be required to extract them. This phenomenon generally happens to the cuspidati: persons who retain the cuspidati of first and second dentition are said to have double teeth. It is not rare to witness this class of teeth, appertaining to both dentitions, remain in the jaws through life-time; they are, in such cases, situated one before the other, the front ones sometimes so prominent as to produce a very repulsive appearance. If we extract, no matter at what period, one of these, the other will by degrees occupy the place destined for it, either in consequence of the constant pressure of the lips, or by that of the tongue. It often happens that the permanent teeth are more rapidly developed, or are proportionately larger than the jaws, they then, being unable to arrange themselves properly, are very much crowded together, and are very irregular. An arrangement of this kind occasions very serious inconveniences. The teeth which are crowded together cannot be easily cleaned, the saliva often of a bad quality, and the alimentary substances insinuate themselves between the teeth, remain there for a time, and cause them to decay. A great proof of the correctness of this opinion is, that the teeth nearly always commence to decay at the parts which are in contact with each other, and that teeth which are naturally separated,



remain much longer in a healthy state than those do which are crowded together.

Every dentist has witnessed the bad effects of a crowded denture, and some have felt the necessity of sacrificing a sound tooth for the preservation of the rest; the tooth thus sacrificed is generally the first bicuspid.\* This operation would at first appear very improper, and it cannot be imagined how we can extract four sound teeth which have produced no pain. But if we reflect upon the important advantages that result from this mode of practice, we will discover that they have not been dearly bought. Its first good effect is the removal of one of the principal causes of caries of the teeth. It is well known that when a tooth decays, the progress of that disease frequently produces an insupportable pain, causes the adjoining tooth to decay, and, after suffering with the tooth-ache for a time, puts the patient under the necessity of resorting to the operation of extracting a tooth which can no longer be retained. If the operation of extraction be a long time deferred, if the greater portion of the tooth be destroyed, finally, if the patient have not recourse to a skilful dentist, the tooth will crumble away, and he will still retain a root which produces the same pain, and which can only be removed with difficulty. The extraction of teeth which are very firmly situated in their sockets should occasion no alarm; for there is a method of loosening them sufficiently, so as to enable us to extract them with facility and without much pain; it consists in placing a large ligature around the neck of the tooth, and allowing it to remain for several days, so as to loosen it.

After a tooth has been extracted, the place which it occupied gradually closes up, by the approximation of the teeth on either side of the aperture. The obliteration of the aperture made by the extraction of the tooth can be greatly facilitated by placing a ligature around the teeth on each side. The other teeth may, if crowded, be separated by the use of ligatures.

When the teeth have thus been separated, they can be more easily cleaned, and their preservation will be greatly enhanced.

### *Manner of correcting Irregularities.*

When the permanent teeth, either through negligence or unavoidable circumstances, have assumed an irregular arrangement in the maxilla, the dental art still furnishes several means of correcting this deformity; but recourse should be had to them as soon as possible, for the difficulty of remedying the evil increases with the age of the subject.

\* See Bourdet, p. 66, vol. 1.

Irregularities of the teeth arise from their inclination outwardly, inwardly, or laterally, or from disorder occasioned by their transposition. These various species of mal-arrangement of the teeth require different means for their correction.

Mal-arranged teeth may be made to assume their proper positions, either by means of a slow and constant process unaccompanied with pain, or by an operation which is attended with some pain, but which acts more promptly, and which consists in luxating the organ and retaining it in its proper place until it has regained its solidity in the alveolus. When the permanent teeth cannot arrange themselves regularly, for want of room, a tooth must then be sacrificed. It will be necessary to enter into a detailed account of the use of the various means of regulating teeth.

A tooth which has taken a mal-direction may always be brought into its proper position by a very slight effort, if sufficiently long applied. If we reflect upon the nature of this phenomenon, we will be surprised to see with what slight effort parts can be made to alter their course. It is in this manner that we sometimes witness the most extraordinary changes in the organism. Thus, in scrofulous affections, which are always accompanied with a condition of general debility, the effects of which manifest themselves particularly in the osseous system, we see the bones gradually yield to the constant weight of the body, or to the repeated action of the muscles which are attached to them, so that the bones become bent in various directions; analogous effects are artificially produced upon the teeth. Hence, when we design to change the direction of a tooth, we pass a ligature around the neck of the organ, near the gum; the tooth then becoming loosened, will easily yield to the means which are made use of to give it the desired direction.

We should observe that in this operation it is not merely an inert power that we are to overcome, but an active force, the direction of which we are to change, and this can be easily accomplished. From the foregoing observations we can understand how a ligature often suffices to reduce a tooth which is very much thrown anterior or posterior to the dental arch. For this purpose, the ligature is to be attached to the neighboring teeth, and then passed around the organ to be regulated; the humidity of the mouth swells the thread, this shortens, and thus the tooth is forced into the desired direction. The thread should be renewed or tightened every day. If this means should not prove effectual, a gold or ivory plate should be used; the plate should be applied to the tooth which is to be regulated, at the same time resting against the neighboring teeth; it should contain several holes, through which ligatures should be passed. This fixture must vary in its

construction, to suit the peculiarities of the case, and its success greatly depends upon the judgment of the dentist. It would be too fastidious to detail every operation of which the teeth are susceptible.

If the patient should be unwilling to be incommoded by the constant use of a ligature or plate in his mouth, the irregular tooth can be brought into its proper place with the key; but this is attended with danger. If great precautions be not taken in performing this operation, if it be not effected gradually, we would be liable to break the tooth. In order to avoid accident in the performance of this operation, a ligature should, several days previously, be tied around the neck of the tooth; it should be renewed daily; in this way the tooth will become loosened, and be more readily brought, by means of the pelican, into the desired position.

The teeth which are decayed should be extracted; but if all of the dental organs are sound, we should remove the first bicuspidæ; these teeth are situated near the middle of the mouth, and their loss can scarcely be detected. When sufficient space has thus been obtained, the teeth must be brought into their respective places, in the manner we have just mentioned.

To separate teeth which are crowded, we may place between them threads or wedges, the size of which must be increased as the organs separate from one another.\*

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### SECTION III.

#### *Means used for the Preservation of the Teeth and other parts of the Mouth, at different periods of life.*

PERSONS who are sickly, especially those laboring under derangement of the digestive apparatus, should pay especial care to their mouth; the saliva, in such individuals, is generally very acrid, and deposits, upon the teeth, tartar in a greater or less quantity. These causes tend to decay the teeth.

The surest means of preventing, or at least of greatly retarding that serious evil, is to clean the teeth every morning and after each meal. This practice might at first appear very troublesome, but if we once accustom ourselves to it, we will perform this duty easily and regularly.

The proper manner of cleaning the teeth is to first rinse the mouth with water, (tepid in winter,) containing a few drops of brandy or cologne, and then brush the teeth with a brush of the

\* For a description of better and more adequate means for remedying the evils here treated on, the reader is referred to Fox, Bell, Delabarre, and other more modern authors upon the subject.—Eds.



proper stiffness. It would also be well to clean the tongue with a tongue scraper whenever there has been any slime deposited upon it during the night; the mouth should again be rinsed.

Persons who do not clean their teeth daily, and those upon whose teeth tartar easily collects, should use a dentifrice. Those sold in shops, composed of ingredients which are not known, should not be used; they are generally made by persons who are ignorant of the proper means of preserving the teeth; hence it frequently happens that the substances of which they are composed are more calculated to injure the enamel of the teeth, than to preserve it. It is true that those powders frequently clean the teeth very well, but it is nearly always at the risk of their preservation. I have convinced myself by analysis, that most of the powders and opiates, sold in shops, contain brick-dust or fine grit, and cream of tartar, which is a tartrate of potash, and other various acid substances. Fine grit, which is nothing more than powdered flint or stone, is too hard, and wears away the enamel very fast.

The habitual use of acids will certainly destroy the teeth, as these organs are composed of the phosphate and carbonate of lime. If the teeth were not living organs capable of resisting the action of agents which tend to injure them, when these agents do not possess a certain degree of energy, it is evident that acids would not fail to injure them; because it is well known that when a tooth is dead, the enamel and bony structure can be completely destroyed by strong acids, and the very weak acids will destroy that part of the teeth which are composed of the carbonate of lime, as this salt is readily decomposed by any acids.

But although the vital action of the teeth resists that cause of destruction, it however should not be abused, for it is always to be feared that those destructive agents will act energetically upon the teeth of delicate persons, the various parts of whose mouth do not enjoy a great force of re-action, and particularly upon teeth already attacked with incipient caries.

It is from the well known evil effects of these powders and opiates that many persons have substituted for them powdered charcoal or tobacco, calcined crust of bread, &c. These substances possess no injurious qualities, the only objection which can be alleged against them is their disagreeable taste and color.

It is at present an easy matter to compose powders or electuary dentifrices which have all the advantages to be desired in such preparations, that is, which clean the teeth without exercising too much friction upon their enamel, which possess an agreeable odor and color, and which even possess the power of imparting a handsome rose color to the gums and lips. We shall at the end of this part of the work give several formulæ of these powders.

We should accustom ourselves in cleaning the teeth after each meal; a tooth-pick made of quill or wood should be used so as to remove particles of food which may have remained between the teeth. They must then be wiped with a towel and the mouth should afterwards be rinsed.

Notwithstanding all of these precautions, it often happens that tartar which easily and in quantities collects upon the teeth of some persons, will insinuate itself between the teeth, collect upon their posterior surfaces and around their necks where it is difficult to remove, when the motions of the tongue are insufficient to prevent its accumulating at these points, recourse should be had to a dentist. The mouth should be examined at least twice a year, so that any disease which may attack the teeth can be arrested in its early stage.

As decay generally commences at the parts of the teeth which are in contact with each other, and announces itself by a black spot; such teeth should be separated with a file so as just to remove a sufficient portion of each organ as will admit of the introduction of a tooth-pick.\*

The enamel of a tooth, generally, should not be removed, and the file should only be resorted to in urgent cases. Teeth should never be filed merely to improve their appearance.

Persons possessing good teeth cannot take too much care to preserve them, and they should always avoid cracking hard bodies with them. Straining the jaws is always calculated to loosen the teeth, and often breaks off a portion of the enamel, which is often accidentally fractured, either from some hard substance in our food, or from blows and falls. A person called upon me who had luxated eight incisor teeth in endeavouring to reach the first floor of a house, seizing alternately with his right hand and teeth a sheet which had been fastened to the window, his left hand being tied behind him; he had nearly reached the window when his teeth gave way. He luxated eight incisor teeth and fell without receiving any other injury. When I saw him the incisores were nearly out of their alveoli, and the cuspidati on the right side were much loosened. I replaced his teeth and retained them in their position with a ligature, I prescribed a gargle composed of the decoction of pomegranate skin, myrrh, rose leaves and white wine; at the end of six days they had re-united to the alveoli, but there was for a long time a weakness in the parts. These precious organs should be used with great care, if we wish to preserve them for a long time.

\* When teeth are separated with a file, the operation should be performed so as to prevent the subsequent approximation of the organs, as recommended by the author in another place.—*Eds.*

All sudden changes of temperature often exercised upon a part, weakens its action and alters its organic structure. The old adage, if the glass of wine drank after soup deprives the physician of a crown, it gives one to the dentist, reminds us of an error too often committed. The injurious practice of drinking cold drinks after eating hot food, hastens the destruction of the teeth, especially when these organs are already diseased. I cannot too often repeat that it is a practice equally injurious to the mouth as well as the stomach, and the evil is greatly increased by drinking ice water after eating hot food.

The daily use of the tooth brush will generally prevent the formation of tartar, although it is not always sufficient in preventing the deposition of that substance upon the posterior surfaces of the teeth where the brush cannot easily reach. Tartar, when first deposited upon the teeth, is very soft, slimy, and can be easily removed, but if it be allowed to remain it will soon become hard; sometimes it will be deposited in thin, brownish hard layers, and adhere very tenaciously to the teeth, at other times it collects in a yellowish and porous mass.

The teeth of some persons are more subjected to depositions of tartar than those of others. It is scarcely ever seen upon the teeth of young healthy persons, while those who have a weak constitution, who are subject to catarrhal affections of the mouth, whose stomach is in a bad state, whose digestion is difficult, whose mouth is constantly inflamed, aphthous, and whose saliva is of a bad quality, have nearly always the necks of their teeth encrusted with this substance, particularly when such persons do not pay special attention to these organs.

There are several reasons which prevent persons who have bad teeth from cleaning them, such as inflammation, pain, &c., and these affections also contribute to a more rapid production of tartar. Cleaning the mouth should not be a matter of indifference, particularly with persons whose teeth are not sound.

When the teeth are covered with tartar, the whole of this substance should not be removed at once, its removal should occupy several sittings, allowing two or three days to elapse between each sitting; if the whole of this substance be removed at once, the teeth being deprived of a covering to which they had become accustomed, would be sensitive, and inflammation and tooth-ache would be the result, more particularly in cold and damp weather. Hence when the mouth is in a very bad state, warm and dry weather should be chosen to operate upon it.

Tartar is only injurious when collecting around the necks of the teeth, it forces the gums from them, in this way the teeth being deprived of a support, become loosened; but independent of



this and the very disagreeable appearance of teeth covered with yellow or black tartar, the presence of that substance is not as injurious as it is generally supposed to be. We scarcely ever see caries form under a layer of tartar, it is even probable that teeth which are in an unhealthy condition, effected with little black spots, flaws, &c., and very sensitive to the action of heat, cold and acids, are protected by the tartar which is deposited upon those parts where the enamel is defective, it then acts as a plug in incipient decay, it arrests or slackens the progress of disease. I have known persons who could not have the tartar removed from their teeth without causing serious injury to the mouth; in such cases I cautiously remove merely that which is near the gums, or which has insinuated itself under them, without scraping the surface of the teeth to give them a white appearance, which is always injurious.

If it be necessary for persons who have not a good set of teeth to be very careful in keeping their mouths clean, those who wear a partial or complete set of artificial teeth should likewise be so. Artificial teeth should be kept very clean so as to prevent their being covered with tartar, from tarnishing and from emitting a very disagreeable smell. These teeth from their constant retention in a warm, humid place, become black and corrode, as they are not endowed with vitality to resist decomposition; they should be often removed and cleaned.

#### *Care required by the Gums.*

Independent of the care which is taken for the preservation of the teeth, it also becomes necessary to pay some attention to the gums when they are not in a healthy state. We frequently observe that the gums of persons of a delicate and catarrhal constitution are soft, slightly swollen, readily bleed and of a livid red hue; the teeth very often in such cases not being firmly fixed in their alveoli, are very loose and appear to be on the point of dropping out. This purely catarrhal disposition is regarded by most dentists as a scorbutic affection, and under this impression they advise the use of anti-scorbutic elixirs. These preparations are composed of a tincture of some gummy or resinous and aromatic substances; they are generally very proper in that affection. We shall give at the end of this part of our volume recipes of such as appear to us to be the most useful for that condition of the gums, and the most proper to impart to them their firmness and natural color.

It is important to remember, that the above condition of the gums is not always a local disease, it is frequently dependent upon a constitutional affection which it will be proper to subdue by the

use of tonics, visits to the country, exercise, fresh air, and all other remedies capable of imparting vigor to the system.

When the affection of the gums is truly of a scorbutic character, we must especially insist upon the internal use of crusiferous plants, and chewing of cochlearia.

In all cases this fungous state of the gums also requires particular care relative to the daily cleanliness of the mouth. We should not use a brush which is too hard, and it should be used with precaution, so as not to injure the tissue of the gums: it would also be advisable to use the brush in a vertical direction instead of horizontally, as it is generally used, for without this precaution we would be liable to destroy that elevated portion of the alveolus which is situated between the teeth, by divesting it of the gum which covers it.

### *Caries.*

Caries is, without doubt, an affection the most injurious to the teeth, and it is important to discover it at its commencement, so as to prevent or at least retard its progress. The first sign that is discovered when a tooth is about to decay, is a small black spot, this generally appears upon the side contiguous to the adjoining tooth. The teeth in the above case should be immediately separated and the black spot removed; this mode of treatment will often remedy the disease, or at least retard its progress and prevent its communication to the neighboring tooth.

The disease at other times attacks the grinding surfaces of the teeth, it first consists of a black spot and very soon forms a cavity in the organ, and becomes painful to the impressions of heat and cold. If on introducing a probe into the decayed cavity no pain is experienced, and if its external orifice is not larger than the interior of the cavity, it should be plugged with metallic leaf so as to protect the cavity from the air and thus greatly retard the progress of the disease. The tooth should be frequently examined, to discover if the plug has fallen out, in consequence of the cavity becoming enlarged, and if this be the case it should be re-filled, provided there exists no cause to prevent it.

When there is a cavity upon the lateral surface of a tooth, and it is capable of receiving a plug, the operation should be resorted to, but if the organ be painful and the cavity larger externally than it is internally, it will be useless to attempt the operation; it will be only necessary to keep the cavity clean. When the teeth which have been plugged occasions pain, the plug should be removed.

Other methods, such as the actual and potential cautery, have been recommended to arrest caries. The use of these remedies

is designed to destroy the dental nerve; but they do not entirely destroy the vitality of the tooth, and the progress of the disease is not completely arrested. The inconveniences attendant upon this mode of treatment is the excessive pain it produces, and the great precaution necessary in its employment.

### *Remedies for Tooth-ache.*

Any cause capable of diverting the mind may relieve tooth-ache. Any violent mental emotions, in persons of nervous susceptibility, are capable of controlling this disease; in this manner persons are often relieved of tooth-ache on approaching the door of a dentist, and also by the confidence placed in various charms, intended for the purpose of relieving the pain.

The application of narcotics, alcoholic tinctures, and essential oils, to the diseased organ, and sinapisms and plaster of cantharides to the temples, will also relieve it. If the pain be a nervous or rheumatic affection, the above remedies may relieve it entirely, and the pain will not return again, or at least not until the lapse of a long period; but should the affection be the result of decay, the relief will only be temporary. It sometimes happens that tooth-ache produced by caries will be relieved spontaneously, or by the use of those remedies which we have just mentioned, and the organ will continue to decay, without giving rise to any further pain.

The actual cautery has also been proposed to relieve pain arising from caries; this remedy is not successful, nor is its use always free from great injuries.

It is not uncommon to see persons, some of whose teeth are longer than the others, which arrangement is the result of injurious consequences. It sometimes occurs that those teeth which are the longest, cause their antagonists, by their repeated action upon them, to become loose and often very painful; should we not be aware of this fact, the pain experienced might be attributed to a disease in the painful tooth. There is no other mode of remedying this evil, but filing the teeth down upon a level with each other, so that the jaws can close accurately, touching at every point.

I have met with some cases of this kind which were pointed out to me, and which had given rise to improper treatment upon the diseased teeth. This error is analogous to that which sometimes happens in cases of wry neck from paralysis of the sterno-mastoid muscle, when the disease is thought to exist upon the side to which the head is drawn by the sound muscle.



*The manner of replacing Lost Teeth.\**

There are few parts of the body that can be replaced by artificial substitutes as completely and as advantageously as the teeth, and consequently there are few branches of surgery in which artificial substitutes are as usefully employed. An artificial crown can be placed upon a sound root remaining in the alveoli; one or several isolated teeth may be replaced in this manner. Several teeth, united together, can be inserted upon one or both sides of the alveolar border, and finally upon both the upper and lower jaws at the same time.

Artificial teeth can be fabricated and adjusted so as to answer the purposes of the natural organs, both in appearance and pronunciation. They may also be so firmly attached as to be useful in mastication.

The principal condition necessary for the insertion of artificial teeth, is firm and healthy gums.

If the gums be diseased, they should be restored to health before the insertion of the artificial teeth. If the dentist be unable to accomplish this, he should not risk his reputation by inserting teeth which will never be of any utility.

It is principally in the insertion of artificial crowns upon natural roots, that we should regard the condition of the gums, and guard against a catarrhal or aphthous state of the mouth; for when the gums are unhealthy, the artificial teeth will produce inflammation, and from the pain that they produce, it would be necessary to remove them; such circumstances bring discredit upon the dentist, who is liable to be taxed either with ignorance or dishonesty.

Artificial teeth should be fabricated of such substances as will not readily decay. Where a single tooth is to be inserted, a natural tooth would be preferable; one should be selected so as to be adapted to the aperture in the dental arch without requiring much filing; this precaution will enhance its durability. The fear which some persons entertain, of catching the disease of the subject from whose mouth the artificial tooth has been taken, is groundless, as the tooth is thoroughly cleansed before it is inserted.

When we propose to insert several teeth, or a complete denture, the tooth of the hippopotamus must be used, taking care to preserve, if possible, the enamel for the anterior face of the denture.

For the insertion of several artificial teeth, the metallic paste used by M. Dubois-Chemant should be used; it, in many respects,

\* The improvements in the manufacture and manner of inserting artificial teeth, since the publication of this work, have been very great, and for the knowledge of which, the reader is referred to more modern works upon the subject.—*Eds.*

is preferable to ivory. This paste, which is porcelain, is not so liable to change and is much lighter than the sea-horse tooth, and it can be made to assume a color corresponding to the natural teeth, and also that of the gums. These teeth, however, are also liable to become disordered in time, and much more so when the digestion is bad, and the saliva of a bad quality; hence persons wearing artificial teeth cannot be too cautious in keeping them clean.

*Manner of remedying Defects in the Palatine Arch.*

A loss of a portion of the palatine arch, especially when it extends to the posterior part of the arch, constitutes one of the most serious evils incident to the mouth. There will be, in such cases, a direct communication between the mouth and nasal fossæ, deglutition and pronunciation can only be performed with great difficulty. Openings in the palatine arch are frequently met with, accompanied by hare-lip; they are frequently occasioned by gun-shot wounds, and venereal or cancerous ulcers.

Unnatural openings in the palatine arch should not be attempted to be remedied, until the disease which has produced them has been completely cured. Thus, those which accompany hare-lip in young subjects may close of themselves, after a re-union of the divided lip has been effected; those which result from a loss of a part of the maxillary and palate bones may also contract very much during the cicatrisation of the lip.

The opening in the roof of the mouth, after the diseases of those parts have been cured, occasion evils of a too serious nature for a remedy not to be desired; this is generally effected by placing a metallic plate, called an obturator, over the aperture; it is attached in various ways, as we shall hereafter describe.

For a long time the object attained by obturators was the closing up of the opening in the palatine arch, to prevent the passage of aliment into the nasal fossæ, and to remedy the nasal sound of the voice; but those fixtures did not remedy other inconveniences which are occasioned by a loss of a part of the palate. The palate is not merely a partition with the uvula attached, designed simply to separate the anterior from the posterior part of the mouth; it is a flexible body which facilitates deglutition, which prevents the passage of aliment into the posterior nares, and which greatly favors pronunciation; hence it is not merely a hole that is to be closed up, but a moveable organ that is to be replaced, so that it can assist in the motions necessary in deglutition and pronunciation. To obtain these requisitions, human industry has of late years succeeded in constructing mechanical fixtures which leave but little room for further improvement. We shall have occasion to speak of these fixtures in another part of this work.

The use of sponge to sustain obturators should be discarded, as this substance, becoming impregnated with saliva, will corrode and occasion a disagreeable smell. It also swells and becomes difficult to remove. Obturators sustained by metallic fixtures are free from the above objections, and they can be readily removed so as to be cleaned, which should be done daily; negligence in keeping these fixtures clean might occasion serious consequences.

#### SECTION IV.

*Various Powders, Opiates, and Elixirs to clean teeth, relieve tooth-ache and cure diseased gums.*

WE propose to give some formulæ, composed of two or three substances, the virtues of which are well known, and which when mixed do not destroy each other's effects.

All powders or elixirs which are composed of drugs having analogous and sometimes very inappropriate effects are not as useful as a mixture of two or three simple substances, the efficacy of which have been tested.

##### *Tooth Powder, No. 1.*

|   |                           |       |
|---|---------------------------|-------|
| R | Prepared Terra Sigillata, | ℥ vi. |
|   | Cream Tartar,             | ℥ ij. |
|   | Cloves,                   | ℥ i.  |

##### *No. 2.*

|   |               |       |
|---|---------------|-------|
| R | Pumice Stone, | ℥ vj. |
|   | Cream Tartar, | ℥ ij. |
|   | Carmin Lac,   | ℥ i.  |
|   | Cinnamon,     | ℥ ij. |

##### *No. 3.*

|   |                 |       |
|---|-----------------|-------|
| R | Dragon's Blood, | ℥ i.  |
|   | Red Coral,      | ℥ iv. |
|   | Fine Carmine,   | ℥ ss. |
|   | Orange Peel,    | ℥ ij. |

N. B. The last powder possesses the property of imparting to the lips and gums a handsome rose color, which will remain upon them during the greater part of the day.

We cannot be too careful in porphyrising these different substances, so as to reduce them to an impalpable powder; particular notice should be had to the quantities of each substance. If these precautions be discarded, the powder will be disagreeable in the mouth, and injurious to the teeth. If the dentist has not sufficient





there is danger of detaching the gums from the teeth by repeated transverse movements, it will be found convenient to clean the teeth with roots, rubbing them in the direction of their length.

Various kinds of roots are prepared for cleaning the teeth. Generally such that are very fibrous are used; the liquorice root\* is preferable, in many respects, to any other; the lucerne root,† which is frequently used for the teeth, possesses a bitterness that is very difficult to boil out. Whatever species of root be used, it should be boiled for a long time in water.

The roots should be sound, straight, and of a proper thickness. They should be cut in pieces of six inches long, and after being sufficiently boiled and slowly dried, should be formed into brushes with a penknife, or repeated blows of a hammer. The marsh-mallow root, which is sometimes used, is not as good as the lucerne or liquorice root, as it becomes brittle when dried.

The roots thus formed into brushes are generally dyed red, by placing them for about 12 hours into a hot decoction of Brazil wood and of cochineal; they are then washed and dried.‡ We may also give them an agreeable odor and taste, by putting them for several hours in spirits of wine, aromatised with one of the essential oils. The roots, after being prepared, should be kept from moisture and heat.

### *Sponges.*

Sponges which are used for cleaning the teeth should be very fine, round, and of the size of a pigeon's egg; and they should be thoroughly cleaned. They are sometimes colored; but they are generally preferred in their natural state.

### *Coral Sticks.*

Coral sticks are seldom now used to clean the teeth, as they are too hard. They are made of the powdered dentifrice which we have before spoken of, and a sufficient quantity of mucilage of gum dragon, formed into sticks of about three inches long, and three or four lines in diameter.

The details into which we have entered, upon these various preparations, may appear trifling; but they are not uninteresting to the dentist. It is necessary that he should be informed of the care to be taken in the preparation of the various materials used in his profession, so that he can properly prepare them.§

\* *Glycyrrhiza glabra.*

† *Medicago.*

‡ Beame's decoction for coloring brushes made of roots is composed of the following ingredients:—Brazil wood, 4 ounces; cochineal, 2 drachms; alum, 4 drachms; water, 2 pounds.

§ A good brush and floss silk, as recommended by Dr. L. S. Parmly, are preferable to any other means that can be employed for cleaning the teeth.—*Eds.*

## PART FOURTH.

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### OPERATIONS.

WE shall speak, in the last part of this work, only of those operations which appertain especially to the dental art; others have been indicated in the second section, when speaking of the diseases which require them.

For the advancement of operative medicine, surgeons have divided the science into different branches. The science of medicine is indeed too comprehensive for one person to acquire a sufficient skill to perform all operations with equal success, and to obtain experience in each branch. Hence some have devoted their attention to midwifery, others to the treatment of the diseases of the eye. In large cities, there are always some physicians who devote themselves to the treatment of syphilitic diseases, affections of the breast, diseases peculiar to women and children, &c. These divisions of the healing art would certainly be the means which would promote the rapid improvement of the medical science, if all who devoted themselves to each branch possessed a general knowledge of medicine.

It cannot be too often repeated, that to whatever branch of the healing art one wishes to devote himself, if it be merely to cut corns, if that branch would be sufficient to keep one occupied, it is essential that he should have a knowledge of anatomy, physiology and general nosology, and to know the resources to be furnished from medicines, without which no information will be added to the general doctrines of the science, by his particular observations. Some practitioners have acquired manual dexterity, very necessary in many cases; but their experience does not contribute to the advancement of the science.

Persons who devote themselves to the treatment of diseases of a part of the system, often think that it is only necessary for them to have a knowledge of the structure and functions of that part, and the diseases to which it is liable. They do not reflect that there is no part which enjoys an isolated action—that the phenome-



na of health and disease which each part presents, depend upon the general principle of life, and that in many cases a local affection requires a general as well as a local treatment. It is often the whole of the organism which it is necessary to modify, so as to remove a local derangement.

When the practice of the medical science is divided into different branches, which are separately cultivated by men who are informed upon the basis of organic principles, it can be said that these men aid in a common undertaking, that they furnish materials for the same science, and that they equally contribute to its progress; while those who are strangers to the structure and laws of the organism, and who practise the different branches of medicine, only divide the medical science by destroying all of its connections; they are guarded by an uncertain routine, and their observations, as well as their experience, are lost, because they are unable to explain them reasonably.

If it be necessary to divide the healing art into different branches for its advancement, it is particularly so in a branch that requires manual dexterity—in operative medicine. He who unites to this branch a detailed knowledge of his art, and the information necessary for practitioners of every branch of medicine, will hold a distinguished place in the science, and will elevate a branch of the healing art, which has been too long pursued by impudent and ignorant practitioners.

## SECTION I.

### *The method of Cleaning Teeth and instruments necessary for that Operation.*

The operation of cleaning teeth often requires great precaution. Hence we should neglect none of the conditions laid down in the practice of all surgical operations, it should be performed *tutò citò* and *jucundè*. However trifling may be an operation, it will become painful and very fatiguing if the necessary precautions be discarded.

Before commencing the operation, the dentist should have every thing which he may require in readiness. He should be provided with a suitable chair, with a head piece to support the head of his patient, and he should pay strict regard to the cleanliness of every thing around him.

He should wash his hands in the presence of his patient, so as not to disgust him when operating. The small instruments which are laid before his patient should be very clean, and have the appearance of being new, so as to remove the idea of their ever

having been in the mouths of other persons. All of these precautions may appear trifling, and be judged by men of but little delicacy to be of no importance, but the generality of ladies require them, and if they be omitted, the patient may become disgusted and the operation will appear longer and more painful than it really is.

If on the contrary, the dentist has neglected nothing to render the operation as agreeable as possible, when he directs the patient to change his position from time to time and allow a few moments to rest, the time occupied in the operation will pass away imperceptibly. He should also be careful to place himself in such a position so as not to breath upon his patient's face.

After having observed all these precautions, and having seated the patient in the operating chair, placed upon his shoulder a napkin to wipe the instruments with, and put before him a chair, or table, containing a basin and a glass of tepid water to rinse the mouth with, he may then commence the operation in the following manner. Standing to the right of his patient, the dentist takes a scaler, which he holds as he would a pen, and commences cleaning the inferior molares of the left side.

With the thumb and index finger of the left hand the lips are held apart and the instrument is supported. The instrument is placed upon the middle of the tooth, directing its cutting edge near the gum and sometimes below it when the tartar has accumulated at that point, it is then with some force drawn from below upwards, bringing with it a portion of the tartar; this manœuvre is repeated until the tooth is perfectly clean. If there are any depressions or holes into which the tartar has accumulated, he should not be too eager to remove it, for fear of destroying the slight layer of enamel which covers the tooth at that point.

All of the molar teeth are to be cleaned in the same manner as just described and with the same instrument. For the removal of tartar which has lodged in the interstices of the teeth, a curved instrument with a sharp point should be used.

For the removal of tartar from the cuspidati, an instrument of a different shape is required, but the manner of using it is the same as directed for the molares. The instrument should always be introduced below the gums so as to remove the tartar, the presence of which if allowed to accumulate at that part would very soon loosen the teeth. Instruments of the shape of a knife blade, but having different curves are used to remove tartar from between the front teeth.

When he has finished cleaning the molares, cuspidati and incisores of the left side, he may proceed to clean those on the right side in the same manner, but he must stand on the left side

of the patient. He should direct the patient from time to time to rinse his mouth, in order to remove portions of tartar which have been disengaged from the teeth.

Having cleaned the anterior surface of the teeth in the inferior jaw, he should next remove the tartar from their posterior surface, for which instruments of different forms are required. In order to clean the posterior surfaces of the cuspidati and incisores, the patient should be directed to lean forward, the operator can then distinctly see the tartar and remove it without injuring the gums.

To clean the teeth in the superior jaw, the dentist proceeds in the same manner and with the same instruments as already described for cleaning those in the inferior jaw. He should commence with the molares of the left side, and with the thumb and index finger of the left hand, should hold the lips apart, the thumb serving as a support to the instrument which is used in the manner of a lever, the index finger should retain the cutting edge of the instrument when raised to detach the tartar, so that the instrument cannot injure the soft parts.

The tartar should also be removed from the posterior surfaces of the superior teeth. The posterior surfaces of the incisores and cuspidati of the superior jaw are rarely covered with tartar, the constant motion of the tongue in mastication and pronunciation tends to remove it, as it is deposited upon them, and the saliva not remaining long at the posterior surfaces of these teeth, cannot deposit much tartarous substance.

When tartar is very thick upon a tooth and adheres to it very strongly, he should not use too much force to detach it in a single piece, because he would be liable to loosen the tooth, but it should be removed by pieces with a sharp pointed instrument.

Although the operation of removing tartar from the teeth is not difficult, yet it requires practice, so as to accomplish it properly and skilfully.

When tartar has amassed itself upon the teeth of persons whose mouths are tender, whose gums are engorged, and whose teeth are slightly loosened, and also upon the teeth of such as are subject to inflammation, catarrh, and aphthæ of the mouth, it should not be removed from these organs at one sitting, the covering to which they have been accustomed, for fear of evils by the sudden shock produced upon the teeth, and the effect of the atmosphere to which they have been unaccustomed.

Notwithstanding the great care we may take in cleaning the teeth, it often happens that they will retain a yellow hue, this is their natural color; hence it would be very unwise to scrape them under the impression of removing this hue, for we would be removing the enamel, which it would be important to preserve



The enamel of teeth is of different shades, and it is my opinion that the whitest are not the best; they have always appeared to me to be more liable to break and to decay.

## SECTION II.

### *The various methods of Filing Teeth.*

TEETH are filed for the purpose of separating such as are crowded, and which announce, by black spots, their liability to decay; to remove incipient caries; to shorten a tooth which is longer than the adjoining organs, and which prevents the proper adjustment of the jaws; to destroy asperities which are a source of irritation to the tongue, &c. The file should be used with great care, as it is always at the expense of the substance of the tooth which is removed, and it is therefore only to be resorted to to prevent a greater evil. Teeth should never be filed to enhance their beauty.

The teeth of children should never be filed, especially their permanent teeth; because the enamel, at an early age, has not acquired sufficient thickness to bear, without injury, the action of the file, and it is always to be apprehended that the osseous structure of the teeth will be exposed, which would cause them to be very sensitive and liable to premature decay.\*

From whatever cause we may be induced to file teeth, the person should be properly seated, and his head kept in a steady position, so that the operator may perform the operation regularly and without jolting.

If we wish to remove a superficial decay from the lateral side of a tooth, we should examine if the adjoining tooth be also decayed; if this be not the case, we should use a safe-sided file. If, on the contrary, the corresponding side of the adjoining tooth be likewise decayed, we should use a file having two cutting surfaces. The operator should stand on the right side of his patient, and hold his file in the same manner as he has been directed to hold his instrument when scaling the teeth.

If we design to use the file upon the superior incisores, the superior lip should be raised with the index finger of the left hand, and the thumb of the same will afford a support to the right hand with which the file is held. The file should be held straight, and its movements should be gentle; when it catches between the teeth, it should be cautiously disengaged, otherwise the instrument or the tooth would be liable to be broken.

\* The enamel of the teeth, always acquires its full thickness previously to the eruption of the organs.—Eds.

If we wish to file the inferior teeth, the file should be held with the thumb and middle finger of the right hand, and the index finger should be placed upon the edge of the instrument; the lip should then be depressed, the thumb of the left hand and index finger of the same hand will serve as a support. The file, during the operation, should be occasionally dipped in water, so as not to heat the tooth too much by its constant motion.

If caries be superficial, it should be entirely removed; but if it extends very much upon the front part of the organ, we should merely separate the decayed tooth from the neighboring one, so that the disease may not be communicated to it.

In filing the lateral surfaces of the teeth, we should always leave a shoulder near the gum, in order to prevent the aperture made with the file from closing.

When a tooth has been filed uniformly through its whole length, and the whole of the diseased part has not been removed, we should, by holding the file obliquely, remove a part of the posterior face of the tooth, without making a wide separation upon its anterior surface, and in this manner the whole of the disease can be removed.

When the disease is upon the anterior part of the lateral surface of the tooth, and penetrates deeply into the osseous structure, we should separate it from the adjoining tooth, and remove the decay from the interior of the cavity; it may then be cauterised, and plugged if practicable.

If we wish to shorten a tooth which is longer than the rest, we should use a flat file, being careful not to jar the tooth during the operation. If the organ to be filed is very much longer than the rest, the filing should be done at several sittings; thus, we should file off about a half line; three months after we may remove a half line more, and so on until the tooth be made of the desired length. Using this precaution, we will be able to remove nearly the thickness of two lines of the substance of the tooth, without any inconvenience, whereas were we to attempt it at a single operation, the tooth would be liable to acute pain and premature decay. By performing the operation at intervals of three or four months, it appears that the osseous part of the tooth which is beneath the enamel becomes thin, takes on an ivory consistency and is truly changed into a kind of enamel. The same phenomenon happens in such cases as we witness in old age when the crown of the tooth is more than half worn away, and without the protection produced by the economy, the spongy portion of the tooth would be exposed. It then appears that mastication and perhaps the effects of the atmosphere gradually hardens the osseous tissue of the organ, and give the grinding surface the

consistency and appearance of enamel. If the enamel is not reformed upon the exterior of the organ, as is the opinion of physiologists, it is not certain that that substance can be reformed in the interior, or at least that the subjacent osseous tissue is not susceptible of taking on a consistency analogous to the enamel, and capable of supplying its place as the enamel is destroyed.

### SECTION III.

#### *The use of the Actual Cautery.*

WE cannot derive as much benefit from cauterising the teeth as has been advanced by several writers. It is in many cases insufficient to put a stop to tooth-ache, which is occasioned by decay; it often exasperates the pain, and if the decay has made great progress, its application is apt to render the teeth brittle and less liable to be preserved.

Neither is the dental nerve as easily destroyed by this means as it has been asserted, or the death of the tooth produced, by which the pain and the progress of decay may be arrested. The tooth remains in connection with the vital action of all the parts to which it adheres, and it is not until we extract it, that we can hope to break off all connections with the neighboring parts, and to reduce it to a state of entire death.\*

The action, however, of a remedy as energetic as that of fire, is sometimes attended with salutary effects; thus, it may, in some cases, suddenly relieve tooth-ache, it may arrest the progress of incipient decay, and in such cases it produces the same effect that it does in all other bones where its application is attended with advantage. The use of the actual cautery becomes indispensable in arresting certain hemorrhages. We shall point out the manner of using this remedy and certain precautions necessary to be observed in its application.

After having removed with the file the greater part of the decay, if we wish to put a stop to the disease with the actual cautery, we should be supplied with cauterising irons of different shapes, and from these, one of a proper form should be selected. The cauterising irons should be adjusted to their handles by means of a screw, so that it may also serve as a burnisher or plugger. When they are to be used as cauterising irons, they should be adjusted to a cork handle; this substance, being a non-conductor of heat, will allow of their being heated and used with safety.

\*The use of the actual cautery has long since been almost altogether abandoned. For the destruction of the nerve in a tooth, excision is far preferable to either of the methods here mentioned.—Eds.



The person whose tooth is to be cauterised, should be seated, and his head supported against the back part of the chair. While the iron is heating in a furnace placed near the patient, the cavity of the tooth should be cleaned out and wiped perfectly dry by means of a lock of cotton placed upon the extremity of a suitable instrument. The neighboring part may be protected from injury by the use of a napkin. The operator should separate the lips with his left hand, which will also serve as a support to his right hand when applying the cautery. When every thing is in readiness, the operator applies the instrument, heated to a white heat, to the diseased part, allowing it to remain but a few seconds; this should be repeated as often as the extent of the disease may require. If, after the expiration of a proper time, we perceive that the disease is about making further progress, we should again have recourse to the same remedy.

After the cavity has been cauterised, it should be plugged, when in a proper condition to undergo this operation.

We should not cauterise a tooth which is very sensitive to the touch, or the impression of heat or cold, because the operation, in such cases, would only increase the pain. We should, in the first instance, endeavor to remove the sensibility of the part, by the use of the alcoholic tinctures of which we have spoken in the third part of this work. A piece of cotton is to be saturated with the tincture, which should be made lukewarm, if the natural temperature of the liquid occasions pain; the application ought to be repeated several times during the day. This mode of treatment is generally more successful with the inferior than with the superior teeth; because the liquid, in the former case, can more easily penetrate the spongy part of the tooth and reach the nerve. If this mode of treatment should not succeed, it will not be attended with any inconvenience. After we have succeeded, by any means which may have proved most successful, in destroying the sensibility of the teeth, we may endeavor to arrest the disease by the application of the cautery. When all of the above directions fail, we must resort to extraction; this mode of treatment most persons who have decayed and painful teeth generally adopt. It is only in particular cases, as young women who are fearful of spoiling their beauty, and public speakers, whose front teeth are necessary for a distinct pronunciation, and the absence of which is always unseemly, that we should recommend the trial of all other means before resorting to that of extraction.

## SECTION IV.

*Manner of Plugging Teeth.*

WHEN the decayed part of a tooth is smaller at its orifice than it is internally, it may be plugged; this operation should not, in such cases, be neglected, as the disease can in this way be arrested, and the tooth sometimes be preserved for many years.

In order that a tooth may be advantageously plugged, it is essential that it has never occasioned pain from the contact of heat or cold, and from the retention of aliment in the diseased cavity.

When the diseased part is not sensitive, and the cavity is of the proper shape to retain a plug, it should be perfectly filled, so as to protect it from the action of the juices of the mouth, and the contact of air, both of which greatly favor the disease of the tissue of the tooth. Without resorting to that operation, which is attended with no inconvenience, the decay will always progress; it will be communicated to the adjoining teeth, and will produce a very disagreeable breath.

If the decay of the organ be painful, we should, before plugging the cavity, endeavor to destroy the sensibility in the manner we have described in the preceding chapter.

When all the necessary conditions exist for plugging a tooth, the person should be seated, and the interior of the decayed cavity wiped; for this purpose an instrument of the proper shape, having a denticulated extremity, wrapped with a piece of cotton, should be used. After the cavity has been wiped with the cotton, the patient should be directed to keep his mouth open, so that the saliva may not re-enter the decayed cavity; the greater portion of the decay should now be removed with suitable instruments, and the tooth plugged after having again perfectly cleaned the cavity with a piece of cotton.

To fill the diseased cavity, leaves of lead, gold, or silver are used; one of these metals is rolled between the fingers into a soft ball, much larger than the cavity, and then introduced and packed firmly into it with proper instruments. When the cavity is filled, the superfluous metal is to be cut off with a cutting instrument, and the surface of the plug is then to be polished with a burnisher. If lead be used, the burnisher should be heated so as to burnish the surface of the plug more readily.

If, previous to plugging the tooth, the cavity appears interiorly very smooth, it may be made rough with an excavator, so that the plug will be more secure. If the tooth, after being plugged, should become painful, the plug must be removed, and the sensibility destroyed by the remedies already recommended; the tooth may then be re-plugged.

## SECTION V.

*Manner of Luxating Teeth.*

LUXATING teeth, like the application of the actual cautery, is not as advantageous as many writers have supposed; it can be practised only in few instances, and it is not always attended with success.

The operation may be attempted upon a tooth slightly decayed, which causes great pain, and which the patient is desirous of preserving. This operation is also sometimes practised in order to bring an irregular tooth in its proper position.

The incisores, cuspidati, and bicuspidés, are the only teeth that can be successfully luxated, because their roots are single. This operation, when practised upon the molares, occasions bloody effusions in their alveolar cavities, which may produce depositions, and necessitate the extraction of the teeth.

To be successful, the operation should only be practised upon young persons, who have good health, and whose gums are in a healthy condition; it is also essential that the tooth to be luxated be but slightly decayed. When all these conditions are fulfilled, the operation, when performed with skill, will be attended with success, of which I have assured myself, from the repeated operations I have performed.

The manner of luxating a decayed tooth is similar to the operation of extraction, requiring two attempts; for when we intend to extract a tooth, we first luxate it with the pelican, or English key, and then extract it with a pair of hawk's-bill or straight forceps.

It will be necessary to place upon the luxated tooth a piece of linen, so that, by the slight pressure of the jaws when closed, it will be retained in its proper position. The patient should be cautioned against using it in masticating for several days; it will be also necessary for him to use a tonic, or astringent wash.

When the incisores or cuspidati are luxated, it will be proper to secure them to the neighboring teeth with a silken ligature. If the teeth are naturally separated, or if there be a vacancy near the tooth to be luxated, occasioned by the loss of an organ, we should fill up the space at the side of the tooth, with a small piece of linen, which should be attached to the neighboring teeth, this will serve to maintain the luxated tooth in position.

In this operation the dental nerves and vessels, are nearly always ruptured, which generally relieves the pain. The tooth which has been luxated will never regain its primitive solidity in the alveolus, unless it has been completely raised from the socket. If it has remained in continuity with any part, even if it be with



a portion of the gum, this will suffice to keep up the continuity of the vital action. The tooth will again receive some fillets of nerves and vessels, by means of which, life will be kept up and the ruptured parts will cicatrice and resume their primitive firmness.

Dentists who luxate decayed teeth to relieve tooth-ache, and to arrest the progress of decay, think that complete extraction, and the luxation of a tooth which shall have but a very slight attachment to the jaws and alveolus, is one and the same thing; there is, however, a very great difference, as much as there is between the life and death of a part. I have never seen a tooth which had been entirely extracted and replaced, to have regained, I will not say life, for that is altogether impossible, but merely its firmness; and I think that we should regard those cases which purport to establish the opposite opinion, to be at least as very doubtful.

The luxation of teeth, for the purpose of re-dressing such as are inclined inwardly, outwardly or laterally, presents more difficulty than when the operation is merely designed to preserve an aching tooth. The operation in the former case is very difficult and rarely successful. It can, indeed, be readily perceived, that a tooth which is inclined inwardly, or outwardly, cannot be easily regulated, because the alveolar cavity which is formed according to the direction of the tooth, cannot be changed to receive the organ in a vertical direction; teeth which have their lateral surfaces presenting anteriorly or posteriorly, are less difficult to be regulated, and in some circumstances the operation may be tried.

Before regulating a tooth, we should employ all means capable of loosening it; hence we should turn it slowly with the straight forceps, using great precautions so as not to break it. When the tooth has been placed properly, it must be retained in its position by securing it with ligatures to the neighboring teeth. A tooth when growing irregular can be easily made to assume its proper position, but when it has once entirely taken an irregular position, the operation becomes more difficult to perform.

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## SECTION VI.

### *Extracting Teeth.*

THOUGH this operation may appear simple and easily performed, it however generally requires great experience, address, a correct knowledge of formation of the mouth, and the various peculiarities which are met with in the teeth and their arrangement and diseases.

An ignorant and daring dentist often extracts the first tooth which may be pointed out to him as the seat of a violent pain, sometimes that tooth is sound, and the pain which continues after the operation, soon appears to seat itself upon another organ. We should not extract a tooth which is painful, unless we are convinced that the pain is depended upon caries. If we think that we can by some remedy relieve the pain and preserve the diseased organ, this should be mentioned to the patient, and the advantages and inconveniences that may result from the practice, also pointed out to him, and should he prefer having the organ removed, it can then be done.

We can ascertain, in cases of tooth-ache, which is the diseased organ, by probing or striking the tooth. Hence, when a tooth is pointed out as the seat of an excruciating pain, if the operator is sure that the organ is not decayed, or if the decay which he may discover in the tooth be not sensitive to the touch of a probe, and if on striking or sounding the tooth, no pain is felt, he may be assured that the pain is not seated in that organ. Dentists would frequently be led into error were they blindly to follow the directions of persons who consult them, and extract all teeth that might be pointed out to them as the seat of the pain which they experience. Persons will often tell the dentist that the pain is in the upper jaw, while the aching tooth is in the inferior jaw, and they will often insist that a sound tooth is the only one that aches, while beyond it will be the tooth really painful and decayed. There are many cases in surgery, where the pain is not felt immediately in the diseased part.

To probe a tooth, we must be provided with flexible probes of various forms, so as to introduce them easily between the teeth, and to discover the cavity produced by caries.

We may sound a tooth by repeatedly striking it with a steel instrument. When the dentist has discovered in this way that a tooth is the seat of pain, it will not be a sufficient reason for him to advise its removal, because the pain may depend upon inflammation, rheumatism, or it may be a peculiar nervous affection; we should also ascertain by means of a probe, if there be any decay in the organ. Sometimes caries exists without our being able to detect it, from the orifice of the disease being in contact with the adjoining tooth; several circumstances may, in such a case, assist an intelligent practitioner in forming his opinion; thus he will see whether there is any inflammation in the gum, whether the same tooth is always painful when touched, if it be sensitive to the action of heat and cold, if the corresponding organ on the opposite side, or its antagonist, be decayed, &c.

Teeth which are decayed, partly destroyed by disease, or when

there is nothing left of them but their roots, which generally produce a disagreeable breath, should always be extracted. Various kinds of instruments, many exhibiting ingenuity on the part of the inventors have been constructed for the extraction of teeth, though all of these instruments may facilitate the extraction of teeth, yet there is one thing which they cannot supply, to wit: the skill of the operator. Good practitioners always operate with a few instruments, and they attach no merit to their beauty; their best instrument is often the one to which they have been in the habit of using. The choice of instruments, however, is not altogether a matter of difference; a few of the most useful ones should be selected, and a skilful use of them should be acquired, for it is this which characterises the good workman.

Whatever may be the instrument used, there is a certain precaution to be regarded in the extraction of teeth or roots, which is not to use too much violence. When we have taken a proper hold of the tooth, we should extract the organ gently, so that the parts to which it adheres may successively be detached. When the operation is undertaken too precipitately, which is regarded as skilful, we render ourselves liable to fracture the teeth and alveoli, or to lacerate the gums.

There is a physical principle in the performance of this operation, which should be remembered, it is this, when a body is distended more rapidly than it can yield to the force applied, it will break. Hence the motions used in the extraction of teeth should be slow and constant; if these precautions be followed, we will very seldom fracture teeth in extracting them. This accident though often trifling, often brings discredit upon the reputation of the operator.

#### *Garengot's Key.*

Some practitioners generally, for the extraction of teeth, make use of this instrument, while others prefer the pelican. Both of these instruments can be advantageously applied in some cases, while in others different instruments will be required.

This instrument which is a very ingenious one, consists of a semi-circular movable hook, adjusted at right angles to the extremity of a steel shaft, the other extremity of this shaft is the handle of the instrument. It is very useful in the extraction of molar teeth which are not too much decayed to sustain the required force in the operation. The sole objection to this instrument is, that the fulcrum rests upon the gum over the tooth to be extracted and also upon that over the adjoining organ; the tooth in consequence of this, if much decayed, will be liable to break, unless the instrument be very skilfully used.



The motion of the instrument must not be too sudden, as it is capable of producing a force which none of the parts to which it is applied can resist. The power which this instrument produces upon the jaw is so great that serious injuries have often been inflicted in attempting to remove those teeth, the roots of which diverge and then approximate at their extremities. An intelligent dentist can generally discover teeth which have such roots; hence when he sees a molar tooth inclined inwardly or outwardly, with a short crown, and when the alveolus is thick, he will endeavour to relieve the pain and arrest the progress of the disease, for he may, in attempting to extract such a tooth, either break it, or remove with it a portion of the jaw. It would be better for a patient to be allowed to complain of a dentist not being able to extract a tooth than to say that he had been injured by him. In this manner a dentist preserves his reputation, and finally acquires a well founded confidence. I have during the course of my practice, several times refused extracting certain painful teeth, explaining to my patient the motives for doing so; they afterwards applied to dentists who were as intrepid as they were ignorant, and who removed the teeth, together with a portion of the jaw, and in this manner produced serious inconveniences. These charlatans sometimes succeed, but transient success, obtained by an ignorant and bold manner, is not to be envied, for such rashness may often terminate in serious consequences.

In order to use Garengeot's key, the patient must be seated in a chair, and his head properly supported upon the head piece of the chair. The operator, standing in front of his patient, takes the instrument in his right hand, and places the hook under the gum, as far forward as possible. He should place a piece of paper, folded several times, upon that part of the gum which is to support the fulcrum of the instrument, to secure the parts from injury. All things being properly arranged, a slow and gradual semi-turn is to be given to the instrument, and the tooth will soon yield to the motion, if it presents none of the obstacles before mentioned.

Teeth are often entirely extracted with this instrument; but it would be advisable, after having luxated the organ, to suspend its use, for fear of fracturing the alveolus, or tearing the gum, and to complete the operation with the straight forceps. The fulcrum of the key is generally placed upon the external side of the dental arch; there are, however, cases in which it would be more proper to reverse its situation. The screw which goes into the hook being movable, allows it to be placed upon either side of the instrument. Hooks have been so constructed as to move in any direction, others have been formed into various shapes; but none of these possess any advantage.

After the tooth has been extracted, the blood should be allowed to flow for some minutes, the patient should, however, be cautioned against sucking the gums, as it may produce an obstinate hemorrhage; the gums should then be pressed with the fingers, so as to bring the parts together, and the mouth rinsed with water and vinegar.

### *Pelican.*

The pelican consists of a hook attached to the middle of a handle. This instrument is difficult to use; but, to one accustomed to it, it possesses great advantages. It is principally intended for the removal of the bicuspides and molares.

### *Straight Lever.*

The straight lever is an instrument analogous to the pelican, with this exception, that the action of the former is in the direction of the shaft, while that of the latter is in a lateral direction; so that the lever is used for the extraction of the front teeth, and the pelican or English key is employed to remove the posterior ones.

### *Straight Forceps.*

This is the best instrument for the removal of the incisores, cuspidati, and gag-teeth of the superior jaw. The operator must stand in front of his patient, and taking the instrument in his right hand, he should place it upon the organ as far up beneath the gum as possible, it should be held in the hand sufficiently tight, not to allow it to slip from the tooth; a rotary motion should then be given to the instrument, so as to detach the tooth from its alveoli, and it then should be drawn perpendicularly.

### *Hawk's-beak Forceps.*

This instrument is not often used, neither is it very certain in the removal of teeth. It may be used to disengage teeth which have started from their alveoli, and which are so entangled between the adjoining teeth, that they cannot be extricated with the fingers. It may also be used to extract stumps which are loose.

### *The Fish Tongue.*

This instrument is used only for the removal of the wisdom teeth. The curve of its shaft admits of its being easily introduced into very narrow mouths. When using this instrument, the operator stands on that side opposite to the tooth which he wishes to extract. He introduces the point of the instrument between the

second and third molares, forcing it as near the gum as possible, he then uses it in the manner of a lever, making a fulcrum of the second molar tooth. The wisdom teeth are generally very easily extracted, they have but two roots which are often united, having the appearance of a single root. The greatest difficulty experienced in extracting these teeth, arises from these organs being situated very far back in the mouth, and from the smallness of the mouth of the patient which prevents the operator from adjusting the instrument with facility. We should be careful and not allow the instrument to slip, as we would be liable to injure the mouth of the patient.

### *Crow's-Foot.*

This instrument is very useful in extracting isolated roots. The superior hook of this instrument, is for the purpose of being introduced under the root to be extracted, the inferior hook rests upon the molar tooth anterior to the root which may then be raised out of its socket. When there is no tooth to serve as a fulcrum, we can use the instrument as a punch. The smaller hook may also be used to remove fragments of roots which are not very solidly attached to the sockets.

From what has been said in relation to the use of the different instruments for extracting teeth, it may be perceived that this operation can be performed with the pelican, the straight lever, the English key, the straight forceps, the fish-tongue, the crow's-foot and the hawk's-bill forceps, upon all classes of teeth as well as roots; it will be only necessary to know when to use each of these instruments and to acquire a skilful use of them.

Notwithstanding the precautions that may be taken in the extraction of a tooth, a part of the alveolus or gum which adheres to it will be also removed. This will rarely produce any serious injury; we should, however, always detach such portions of bone and gum, before showing the tooth to the patient, as it will create unnecessary uneasiness, and will prevent him from saying, as it is often said, that the dentist had extracted with the tooth a portion of the jaw-bone; this is a trifling accident which it is not in the power of the dentist to foresee or prevent, but which often reflects discredit upon his reputation.

Certain dentists have publicly announced that they are able to remove teeth with an astonishing facility, without producing the least pain, either with their fingers, or with the point of their sword. It should be remembered that if those dentists do really possess this superior skill, they would not be obliged to expose themselves publicly like charlatans, for the public would soon hear of their skill, which they would test by giving them their patronage.



They employ a man who presents himself to the operator, and who feigns that he has the tooth-ache, and he places in his mouth a large molar tooth slightly decayed, with very large roots, and a little bladder filled with blood. The dentist after examining the tooth, places himself before his patient, and with the point of his sword pricks the bladder, the patient then spits out a bloody tooth which is exhibited to the astonished bystanders.

If a person having a tooth which is difficult to extract, were to apply to these dentists, he would tell him that the tooth ought not to be extracted, inasmuch as it can be preserved; he then requests his patient to call upon him at his tavern, where he performs his operation like other dentists.

It should also be remembered that the teeth of many persons who consult them, are very much loosened, and can be easily extracted, which often may be done simply with the fingers; with such cases the confidence of the public is readily gained, and the dentist then finds that he can easily dispose, at a good price, of his elixirs and opiates, which possess most *extraordinary virtues*.

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## SECTION VII.

### *Accidents which may result from the Extraction of Teeth.\**

VARIOUS accidents and some of a very serious nature sometimes occur from the extraction of teeth, notwithstanding the skill and care with which the operation may be performed. These injuries may happen during or after the extraction of the tooth. The injury may be confined to the tooth, or it may consist in lesions of the neighboring parts, or the whole organism may be more or less affected by this operation.

The most common injury resulting from the extraction of teeth, is the fracture of the tooth; this is most likely to occur when the tooth is much decayed. Teeth that have become brittle from cancerous, rachitis, scorbutic, syphilitic affections, the immoderate use of mineral acids, old age, &c., are very liable to be broken in endeavoring to extract them. The fracture of a tooth may also depend upon the size, divergency or convergency of its roots, and its attachment to some part of the jaw. Although it is difficult to foresee the causes which are productive of fracture, we should, however, be very cautious in extracting those teeth that have short and thick roots, and such as present high prominences above the alveolar border.

\* See M. Duval's dissertation upon this subject.

The molar teeth are sometimes so firmly situated in their sockets to which they adhere very strongly, that they or the instrument will break in attempting to extract them; but this occurrence is owing to the too sudden motion given to the instrument.

Sometimes in attempting to extract a tooth, two teeth united together will be removed; but this accident, which it is impossible to prevent, is fortunately of rare occurrence.

The removal of a permanent for a deciduous tooth, or a sound organ for a decayed one is only the result of the ignorance of the operator. A sound tooth may be accidentally removed by the patient suddenly moving his head, which will cause the hook of the instrument to slip from the diseased tooth that was to have been extracted. It is common for a portion of the gum to be removed with the tooth to which it adhered very strongly; generally this is of little importance, it is however sometimes followed by hemorrhage, or inflammation. Inflammation of the gums may also be the result of contusion of the parts produced by the fulcrum of the instrument; to avoid this, the fulcrum should be supplied with a pad.

The pain occasioned by the extraction of a tooth may give rise to inflammation and its consequences; hence, when we operate upon a person of an irritable, or catarrhal constitution, during cold and damp weather, and the operation is attended with severe pain, we cannot be too careful in preventing or subduing the inflammation that may be produced.

A portion of the root of a tooth which may remain at the bottom of the socket, will generally be very soon covered by the soft parts, and no evil consequences will result from it. The removal of a portion of the alveolar border is likewise generally unattended with evil consequences, but these accidents sometimes do produce inflammation, which it becomes necessary to prevent when possible.

When we have cause to anticipate inflammatory symptoms after the extraction of a tooth, we should endeavor by suitable means to prevent them; thus the bleeding should be promoted for a time by the use of tepid water, after which an acidulated gargle, rendered slightly detersive by the addition of spirits, ought to be used. If inflammation occurs in defiance of our precautions to prevent it, we should endeavor to limit it, and to affect resolution by the employment of antiphlogistics, such as diet, rest, soothing drinks, blood letting, cataplasms, emollient gargles, &c.

The inflammation sometimes will terminate in an abscess which will expel the portion of the root which is left in the socket, or the little spicula of the fractured alveolar border. Sometimes

the inflammation will extend to the fractured bone and exfoliation, and a fistulous opening, will be produced which can only be remedied by the removal of the necrosed portion of bone.

When a portion of the jaw has been fractured by suddenly removing a large molar tooth, we should endeavor to prevent the inflammatory evils in the manner before indicated, and maintain the fractured splint piece in position, so that it may become consolidated to the body of the bone, like all simple fractures.

There is no evil resulting from the fracture of a portion of the alveolar border, so serious as that which occasions an opening into the maxillary sinus, either by the extraction of a tooth, the roots of which penetrate this cavity, or from the fracture of a portion of the floor of this cavity. If an accident of this nature occurs in a young subject of a good constitution, we have reason to hope the opening will in time close up; in contrary cases, we may apprehend that the wound will remain fistulous.

If the mouth be opened very wide during the extraction of a lower tooth, and the dentist presses very much upon the jaw, luxation may be the result. Luxation of the jaw should be immediately reduced, in the manner we shall describe, when speaking of that accident.

### *Hemorrhage.*

The hemorrhage that follows from the ruptured vessels, after extraction, is slight and salutary; it tends to prevent inflammation, and it would be unsafe to arrest it suddenly, as it is sometimes done by the use of cold acidulated water, immediately after the removal of the tooth. Nor should the parts, rendered sensitive by the operation, be irritated, if we wish to avoid inflammatory symptoms.

Hemorrhage generally stops spontaneously; it does however happen, that the blood continues to flow so long, or so often re-occurs, as to become dangerous, if it be not arrested, which may be done by cold and acidulated gargles. If the bleeding resists the above mode of treatment, a compress of cotton, agaric, &c. dipped in acid, powdered resin, or gum arabic, ought to be applied to the part. In very obstinate cases, recourse should be had to the actual or potential cautery. The most obstinate hemorrhages are not generally such as are produced by the violence used in removing the tooth, or from the laceration of the gums; but they are occasioned by a fungous state of the gums, and a scorbutic diathesis of the system; in the latter case the hemorrhage frequently returns.

The transient tears that sometimes follow the extraction of a superior tooth, merely shows that the nervous irritation is extend-



ed along the nose as far as the lachrymal gland, but is not indicative of an immediate relation of the tooth with the ball of the eye, as some persons suppose.

The pain attendant upon the extraction of a tooth sometimes produces, in very nervous persons, syncope, a general trembling, and even convulsions. It sometimes excites a nervous attack, or a paroxysm of epilepsy, in persons who are subject to them. It may also produce abortion with very nervous females.

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## SECTION VIII.

### *Artificial Teeth.*

WHEN the natural organs are so much decayed as to require extraction, there remains no other means of repairing their loss than to substitute artificial teeth. Persons who have been so unfortunate as to lose their teeth at an early age are capable of appreciating the advantages of artificial ones; these are especially desirable to public speakers, and to women, who are desirous of preserving, as long as possible, all the attributes of beauty.

When artificial teeth are well executed and properly adjusted to the mouth, they do not merely bear a strong resemblance to the natural organs, but they are useful in masticating and speaking.

Various materials have been used to manufacture artificial teeth from; as human teeth, the tusks of the large terrestrial and amphibious animals. Hence they are manufactured from the teeth of the hippopotamus, the elephant, the sea-cow, and even from the tibia of the beef. Artificial teeth are also manufactured from mineral paste. The human teeth are at present very seldom used, those of the sea-horse, and those manufactured from the mineral paste, have been substituted for them.

A human tooth, artificially set, answers very well when we wish merely to replace an incisor or cuspidatus; but when it is necessary to insert a portion or an entire set of teeth, the tusk of the hippopotamus is generally preferred; teeth made of this substance are whiter, not so porous, retain their color longer, and resist the action of the saliva for a longer period than the teeth of other animals will. That substance, however, does not possess the advantages which are found in the teeth composed of Messrs. Dubois and Chement's mineral paste. These two gentlemen have discovered a mineral paste, which is preferable to any other substance for the manufacture of artificial teeth. It is hard, and not susceptible of decomposition, as it is a kind of porcelain; it can readily be carved and made to imitate the gums upon which the teeth are to rest, by adapting it, when soft, to the plaster moulds.

These pieces can be made to resemble, in shade and color, the gums and the teeth along side of which they are to be placed.

I have, for several years, used this composition, and I have found it to possess all the advantages to be desired in the manufacturing of sets of artificial teeth. I have purchased of M. Dubois-Chement, of Paris, the recipe for making this composition, which I am not allowed to lay down in this work.

### *The Instruments necessary for the Manufacturing of Artificial Teeth.*

To manufacture artificial teeth, the dentist should be provided with the following instruments, viz. a large vice, several saws to cut the bone or ivory of which teeth are made, files, flat and half round, rasps to shape out the pieces, &c. He should also have a jeweller's small vice, compasses of different sizes, fine files of all shapes, several small saws, gravers, scrapers, drills, pumice stone to polish with, pincers of several shapes, cutting forceps, a draw-plate to manufacture metallic ligatures of different sizes, punching forceps to pierce holes in metallic plates, and several other little instruments which he may find useful to him. These are the principal instruments which a dentist should have, not merely to serve for the manufacture of artificial teeth, but also for obturators and other artificial pieces, designed to remedy some deformity of the visage.

The dentist should be very familiar with the use of all of these instruments; but should he have so much business as not to be able to do his own mechanical work, he should employ a good workman, whose work he should direct, and which the dentist should himself finish.

### *Different kinds of Artificial Teeth.*

Single and sets of artificial teeth may be made and adjusted in different ways, according to the part they are to occupy, the particular disposition of the parts, &c. Teeth can be inserted with a pivot, a screw, a ligature, and with a spring. We shall point out the cases in which these different ways of inserting teeth are proper, and the manner in which they are effected.

#### *Pivot Teeth.*

Single artificial teeth, placed upon a root by means of a pivot, are the most secure, and bear a greater resemblance to the natural teeth, than when inserted in any other manner; but teeth cannot always be inserted upon a pivot. The incisores and cuspidati of the superior jaw are nearly the only teeth which will admit of being replaced by an artificial crown, sustained by a pivot, be-

cause these teeth have but one straight root, and are sufficiently strong to receive a pivot; fortunately these teeth are generally found in a condition to be replaced in this manner. We cannot so advantageously pivot the cuspidati, and especially the incisores of the lower jaw, because their roots are short, and flattened laterally. The inferior bicuspidates may be replaced by artificial crowns, as they have generally a single and round root, while the roots of superior bicuspidates are generally bifurcated, which will not admit of this mode of insertion. The loss of the bicuspidates not being easily observed, there is seldom any necessity of supplying them by artificial substitutes.

When the crown of a tooth is broken, or greatly destroyed with caries, and the root is in a proper condition to receive a pivot, the remaining portion of the crown must be filed down upon a level with the gums. When the remaining portion of the crown is very strong, we should first file as near the gum as possible, a fissure upon its anterior, and if possible its lateral surfaces; then with a pair of cutting forceps the crown may be easily removed, the root may then be smoothed off with a half round file.

To enlarge the dental canal a drill is made use of with which the soft and decayed parts are removed, and a hole of about three or four lines in depth is effected. If the interior of the root be redish, and if it be sensitive, we can destroy the sensibility either with the actual cautery, with essential oils, or alcoholic tinctures. When the root is prepared, the artificial crown must be adjusted so as to resemble perfectly the natural teeth, and it should be perfectly adapted to the root. In order to adjust the pivot near its proper place, we should adopt the following method; a piece of paper, cotton or any other analogous substance should be placed into the cavity of the root; the substance thus introduced must be cut level with the root, and then blackened with ink. If the artificial crown be now placed exactly in the position which it is to occupy, there will be a black spot upon it at the point where the pivot should be inserted. The crown should then be drilled at the point marked with the ink, the drill should be directed in such a manner that it will pass through near the middle of the posterior part of the tooth. A piece of round pure gold of a proper length, and somewhat larger than the hole in the crown, is to be forced through the hole and rivetted on the posterior part of the crown. That portion of the pivot which is to be inserted into the canal of the root, should taper down to a point, and present along its sides, notches made with the file, so that the thread or cotton which is wrapped around it may remain secure. Some force should be required to insert the pivot in the canal of the root, and when the artificial crown is properly adjusted, it should



have the appearance of coming out from the gums. When the root upon which the artificial crown is to be inserted, is sound, and there exists no cause to produce inflammation, a pointed screw pivot can be made use of, which may be screwed in by turning the crown, or with a screw-driver: the artificial crown should fit closely to the root.

A root which is very much decayed and which presents a large canal, can be put in a condition to receive a pivot; in order to effect this, the root should be plugged, a hole should then be drilled in the middle of the plug, and into this canal the pivot should be inserted. If it be impossible in consequence of the state of the root to insert the artificial crown very securely by means of a pivot, the crown may be secured to the adjoining tooth with a ligature.

It sometimes happens that the pivot occasions great pain a short time after its insertion; in such cases it should be withdrawn and made shorter, after which it can be re-inserted. The artificial crown should not be longer than the natural organs, and it should be made thin by removing part of its posterior surface, so that it cannot touch the lower teeth when the jaws are closed.

The presence of an artificial tooth, frequently produces inflammation which may terminate in a deposition upon the gum over the neighboring organ. When the inflammation cannot be arrested by the use of tonic and astringent washes, we should wait until the inflammation subsides, and the root has regained its former solidity in the socket, when we can replace the artificial crown without producing further inconvenience.

Pivot teeth are generally made of natural teeth prepared by proper macerations, and sawed off near their crown. They should resemble in form, size and color, the teeth which they are to replace. The enamel should be removed from their posterior surfaces so as to make them thinner, and so that they may not be so liable to break in inserting the pivot.

The teeth of the hippopotamus are often used for the manufacture of artificial teeth; when they are well selected and properly worked, they resemble very closely the natural teeth, and are more solid than natural teeth artificially set. We can also impart to them the hue that may be desired, by soaking them for a longer or shorter time in a strong decoction of tea or coffee; in this way they can be made to resemble the adjoining teeth. In manufacturing these teeth, the enamel should always be preserved upon their anterior surfaces, so that they may retain their color and polish for a long time.

*Teeth retained by Ligatures.*

If we wish to insert a tooth, and there is no root remaining in the gum, we can fasten the artificial organ to the adjoining teeth, by drilling two holes in the sides of the artificial tooth, opposite the teeth between which it is to be placed, and passing ligatures through these holes. It is sometimes difficult to obtain a natural tooth of the same class as the one which has been lost, or one which will be properly adapted to the vacancy; we will then be necessitated to make one from the tooth of the hippopotamus. If the anterior border of the alveolus is partly destroyed, which frequently happens, the artificial tooth should be supplied with an artificial gum, to which a reddish color, in imitation of the natural parts, must be given. We can also, in similar cases, mount a natural tooth upon a sea-horse base, which is to be a substitute for the gum. All of these pieces are attached, by means of ligatures, to the neighboring teeth.\*

## SECTION IX.

*Artificial Blocks of Teeth.*

WHEN we wish to replace several teeth adjoining one another, they should be carved from one solid piece, and if the patient has roots remaining which are capable of receiving pivots, these teeth should be inserted in the same manner as directed for a single artificial tooth, by inserting pivots into all of the roots which are capable of retaining them; but when there are no roots, the piece must be sustained by ligatures. Artificial teeth which are to be retained in the mouth with ligatures, should accurately fill up the space between the teeth to which they are to be made fast; for if they be too large they will force the teeth back and loosen them; if, on the other hand, they be too narrow, the same accident may also be produced.

Care must be taken that the artificial block be not longer than the rest; if it appertains to the superior jaw, the teeth should be bevelled off upon their posterior surfaces, so as not to interfere with the inferior teeth when the jaws are closed.

To insert a partial set of artificial teeth, we must file down level with the gums all roots which are sufficiently sound to receive pivots; we must then place a piece of wax upon the space to be occupied by the teeth, directing the patient to close his jaws,

\* The practice of fastening one or more artificial teeth with ligatures to the adjoining teeth, has long since been done away with.—*Eds.*

so that the impression of his inferior teeth may also be made in the wax, the whole should then be carefully withdrawn. Plaster, mixed to a proper consistency with water, should be poured into the wax impression and made to extend a few lines beyond the wax. The plaster should remain for about one hour to dry. Two depressions must be made upon the extended portion of the plaster and oiled; fresh plaster should then be poured into these depressions and extend over the other side of the wax; in this manner we obtain a mould of the inferior and superior jaws. The plaster should now be placed before a fire and the wax melted from it; the impression of the parts to be supplied with teeth should be carefully taken, as the correct adaptation of the teeth to the alveolar border depends altogether upon this.

When the mineral paste is used, it can be correctly adapted to the model, and carved when in a soft state.

If the sea-horse bone be used, the base must be first adjusted to the mould, and the teeth must be afterwards carved.

The front teeth may be replaced by natural organs, mounted upon a base of the sea-horse tooth, which will also serve as an imitation of the gums.

M. Bourdet recommends natural teeth to be inserted into a base after the manner of the adaptation of the natural organs into the alveoli; the anterior face of the artificial base should be enamelled and made to imitate the gums in form and color. The natural teeth are secured in the sockets of the artificial base by means of pivots, and mastic should be placed between the sockets and teeth. This is an ingenious mode of inserting teeth, but it is difficult to execute properly.

To enamel gold, it will be necessary that this metal should be of a certain thickness, which would make the teeth expensive, and it is difficult to imitate the color of the gums upon this metal; this, added to its price, renders it objectionable.

Several natural teeth may be inserted by uniting them with a gold wire, which is made to pass through their sides, as advised by M. Fauchard. They may also, as recommended by the same author, be inserted by adjusting to their posterior surface a little gold plate, which is to be secured by means of a pin which should be rivetted to the tooth and to the plate. When teeth mounted in this manner are well executed, they will be very strong, and present a very handsome appearance; but it must be observed that we cannot insert partial sets of natural teeth, mounted in any way, unless the breach into which they are to be inserted is sufficiently high to receive them. When teeth have been lost for a long time, the organs in the opposite jaw are forced out of the sockets from a thickening of the bottom of their alveoli, and have



the appearance of having elongated. Moreover, they not being used in mastication, are not, like the rest of the organs, worn down, and they are always longer than them; from this cause we are obliged to make very short artificial teeth from sea-horse bone or mineral paste, and we are compelled to file the edges of the antagonising teeth, so as to give to the artificial piece a sufficient thickness.

If there be one or more good roots remaining in the mouth, these will afford a most favorable means of supporting the artificial teeth. If there be two roots which correspond to the extremity of the artificial piece, their canals should be drilled, and a screw or pivot should be passed through the artificial piece into the roots, as has been recommended for the insertion of pivot teeth.

When there are no roots in the mouth of the patient, the artificial piece must be attached to the adjoining teeth with ligatures.

Artificial teeth may be placed in the superior jaw when there exists only one tooth to fasten to. In this case, Bourdet recommends us to make the artificial piece in such a manner that it will embrace the natural tooth, to which it should be secured with a ligature; the other side of the piece should be deeply grooved out, so as to take a firm hold of the gums; in this way there will not be so much danger of injuring the natural tooth. When there are several isolated natural teeth, the artificial piece should contain as many grooves, and the ligatures should be fastened to those teeth which are situated in the posterior part of the mouth. When there are two or three sound teeth contiguous to one another upon one side of the mouth, the artificial piece should contain a groove which should embrace the natural teeth, and be secured to each of them. The dentist will have to be governed by his judgment, and vary the mode of fastening the teeth according to the peculiarities of each case.

#### *Various kinds of Ligatures used to fasten Artificial Teeth.*

Ligatures which are made use of to fasten artificial teeth are made of gold, platina, silver, flax and silk.

The metallic ligatures are stronger and more durable than those made of other materials; but they become loosened, injure the teeth by producing in time a groove around them. We can partly remedy this inconvenience by using very pure metal, by making the spring flat before using them. These ligatures are moreover objectionable on account of the patient being unable to renew them without the assistance of the dentist, which prevents them from cleaning the artificial teeth as often as it is necessary to do.

Though silken and flaxen ligatures are not as durable as metallic ones, they are, however, preferable to them, from the circumstance of the patient being able to change them. Moreover these ligatures will last as long as it is necessary for them, as it will become essential to change them after a certain time.\*

## SECTION X.

### *Artificial Dentures.*

PERSONS who have teeth very much diseased often lose them entirely at a very early period in life. They endeavor, by the means that have already been pointed out, to preserve them as long as possible. Artificial teeth are placed in front of the dental arch, to replace the incisores and cuspidati, which have been lost, and are secured to such roots as are in a healthy condition, or are attached to the neighboring teeth, which offer sufficient strength for a proper support, but in time these points of attachment will give way. The peculiar constitution which has given rise to the decay of the first teeth, continues to act upon the remaining organs, which one after another become carious, or loosen and finally drop out, after repeated inflammations, so that they are not only unable to support the artificial teeth, but they themselves require to be replaced by artificial substitutes.

When one or both jaws are deprived of teeth, artificial organs formed of one solid piece are resorted to. The manner of fabricating and inserting pieces of this kind, varies, according as they are intended for the superior, or inferior jaw, or for both jaws at the same time.

### *Dentures for the Inferior Jaw.*

If all of the teeth have been removed from the inferior, and there still remains a sufficient quantity of these organs in the superior jaw, a complete denture composed of one solid piece may be inserted in the inferior jaw. When the artificial piece is well made, and correctly adapted to the alveolar border, it will be retained in position by the lips, the cheeks, the tongue, and its own specific gravity, as to require no other support. It will require some time for the person to become accustomed to its presence, and then he will be able to perform with it all the functions of the natural organs, both in speaking and eating.

An artificial piece for the inferior, should be extended farther

\* The improvements made in this branch of the art, since the publication of this Treatise, render the directions here laid down, insufficient as a guide to the student or young practitioner.—Eds.

back and be thicker than is required for the superior jaw ; it will be advantageous to make it of a heavy substance. Hence it may be carved out of a piece of sea-horse tooth, or made of a sea-horse base, or of a platina or gold plate, mounted with natural teeth. An inferior denture should be six lines high in front and should exceed this height near their extremities. The teeth can be made of the natural height, and the rest of the piece be left for the gums. It is also important that it should embrace properly the contour of the alveolar border at every point, and that it be a little elevated along the coronoid apophysis against which it can rest.

Artificial teeth adjusted in this manner can be readily taken out and cleaned, and replaced by the wearer.

### *Dentures for the Superior Jaw.*

When the superior jaw is totally deprived of teeth while the inferior still retains many of these organs, though this fortunately seldom happens, we cannot so readily adjust an artificial piece, as it will naturally tend to fall out by its own weight. They are, in cases of this nature, obliged to be supported by a spring, which must be attached to the inferior jaw.

When the last molares of both sides of the inferior jaw have been lost, there will exist a most favorable condition for the support of the artificial piece. In such cases two pieces of sea-horse tooth are to be properly adapted to the parts where the molar teeth were situated ; to these are to be attached springs which are to give support to the artificial teeth in the superior jaw. The two artificial pieces should be connected by a metallic band, which must pass along the internal side of the alveolar ridge behind the inferior teeth. If the dental arch has been wasted away, if the inferior lip constantly covers it, we may likewise secure the two inferior pieces by means of a metallic band, narrower than the first, and made to pass anterior to the teeth, and give to it a gum color, so that it may not be so easily detected. The bands should be so adapted as not to irritate the gums or tongue ; a few holes might be punched in it, and ligatures passed through them and secured to the natural teeth.

The two inferior pieces of sea-horse should contain a groove upon their anterior extremities, so as to embrace the natural teeth to which they are contiguous ; this will render the artificial pieces more securely situated in their proper places, they should also be pierced with holes to receive the springs which are to sustain the superior denture. When the molares of the lower jaw still remain, a metallic band is adapted to the inner circle of the inferior alveolar arch, with its extremities turned over the molar teeth,



and terminating upon their anterior face, by a prolongation intended to receive springs which are to support the superior denture.

If there be but a few isolated teeth, or several contiguous to one another remaining in the inferior jaw, we should, as has been advised by Fauchard, make the artificial piece of a solid block, with grooves to allow of its being passed over the natural organs. This artificial piece must then be attached to the superior one by means of springs; this mode of application does not differ from the manner of inserting a double set of teeth.

The superior artificial denture should be of a less thickness, and lighter than those intended for the inferior jaw; the former are only necessary to be four lines high, giving to the teeth, however, their natural width. It is not necessary that this, like the inferior denture, should occupy the whole space that the natural teeth had done; but it should only be sufficiently long to contain merely twelve teeth, and it ought, in other respects, to be made as light as possible.

In order that the artificial piece may remain steadily in the mouth, it should be well adapted to all the inequalities of the gums and hollowed out so as to embrace the contour of the alveolar border. The spring that is to connect the superior and inferior teeth do not differ from those used in sustaining a complete set of dentures of which we shall now speak.

### *Double Set of Teeth.*

When all the teeth of both jaws have been lost, we can insert a double set of teeth, sustained by springs; but, to effect this, there should be neither a tooth or root remaining. Should there be any tooth remaining in the mouth, we ought not to hesitate to extract it, in order that persons may enjoy the advantages to be derived from an entire double set of artificial teeth. It is important that the two artificial pieces should be plumb upon the alveolar border; to accomplish this, we should place a piece of wax between the jaws to obtain a correct form of them, and from this, a mould should be procured.

The two pieces should only occupy the same extent of surface as the natural teeth had done, so as to allow sufficient space for the springs to act freely. Thus they should extend only as far back as the part occupied by the first molar, inclusively.

Double sets of teeth may, as in partial sets, be made of various materials, some are composed of natural teeth mounted upon a sea-horse or metallic base. These kinds of teeth are difficult to make; but they possess the advantage of being easily removed, cleaned, repaired with facility, and of retaining, or enamelling anew, their base of a gum color.

Dentures formed of the sea-horse tooth, when well carved out of a well selected material, and when the enamel has been preserved upon the anterior face, produce a very handsome appearance, their beauty and extreme whiteness is perhaps a fault. They are also too heavy, especially for the upper jaw.

The best material for making artificial teeth, is without doubt, M. Dubois-Chement's mineral paste. It is light, easy to form in the desired shape, and can be made of any color desired, both to imitate the gums as well as to assume the natural color of the teeth.

From whatever materials dentures may be fabricated, we should always have the superior set lighter and higher than the inferior, both being of the proportions which we have indicated in the preceding articles.

The springs intended to fasten the two sets are constructed of various materials; such as steel or gold bands, pieces of whalebone, and gold wound in a spiral form.

Platina is now mostly used for the construction of springs. A method has been discovered by which this metal can be separated from all foreign substances, and especially from arsenic, which it always contains, and renders the metal brittle and difficult to work. This metal is preferred on account of its hardness and unalterableness; and also because it is not so expensive as gold.

Steel springs, recommended by Fauchard, are very good on account of their elasticity, but their liability to rust by the moisture of the mouth, notwithstanding all precautions that may be taken with them, is a sufficient cause to induce us to abandon their use entirely.

Whalebone springs are without doubt the most objectionable of all others; the moisture, to which they are constantly exposed, deprives them of their elasticity in a short time, but they are often used for the sake of economy.

Pieces of whalebone, used for the purpose of springs, should be sound, and their exterior surface should be preserved; as this is the most polished and the most elastic part of the bone, the springs should be taken from the mouth nightly, and kept in straight position, in order that they may retain their elasticity; with such precautions they will last a long time.

When metallic springs are used to maintain the teeth in the mouth, they should be made of a narrow gold or platina plate, or of wire made into a spiral form. Both of these methods can be very usefully employed; but preference is to be given to the wire in spiral shape, for such springs will sustain the set of teeth without pushing them as much forward as the metallic plates would do.

When springs are made of narrow strips of metal, they should be thin and elastic. Each extremity of the springs is placed into a depression made upon the artificial piece, intended to receive these, and are there rivetted.

Spiral springs are placed into a deep fissure made upon the external surface of the extremities of the upper and lower sets of teeth; two holes are made in these fissures, to receive the ligature or rivets with which the springs are secured. To secure all the advantages of pronunciation and mastication, which are to be derived from the use of artificial teeth, it is not only necessary that they should fit well and be perfectly adapted to the alveolar border, but it is necessary that the person who wears them, should become accustomed to their presence. Time and patience are the only means of obtaining this end. It will require at least six months before they will remain very steadily in the mouth, and for them to serve all the purposes of the natural organs.

## SECTION XI.

### *Obturators.*

THE causes which produce unnatural openings in the palate, or which occasion a division or even destruction of the palate, and also of the uvula, proceed, generally, from hare-lip, gun-shot wounds and syphilitic affections.

Seeing an opening which produces a communication between the mouth and nasal fossæ, the first idea which presents itself is to close the opening, so as to prevent the passage of aliment into the nasal fossæ, and to remedy the defect in articulation of words.

Openings in the palatine roof appear to be of very rare occurrence among the ancients, they were merely affected with a separation of the bones which sometimes accompanies hare-lip. Obturators are not spoken of by the Greeks and Latins, nor those who first wrote upon surgery; it was not until the use of fire arms, and more particularly since the prevalence of syphilitic diseases, that openings in the palatine roof commenced to be of so frequent occurrence. Obturators were first mentioned by Alexander Petronius, in his treatise upon venereal affections; this author recommends the opening in the roof of the mouth to be closed with wax, cotton, or a gold plate, without telling us in what manner the plate should be sustained in position. It was not until ten years after the appearance of the writings of the author just mentioned, that Ambrose Paré exhibited in his work on surgery, drawings of obturators. Improvements have been made in them from time to time, and now they have arrived to



such a state, that there is scarcely any room for further improvement.

Obturatorers were formerly used simply for the purpose of closing the opening in the palatine arch, and were made of various forms and sustained in different ways. We shall describe these different obturators, and point out the peculiar advantage that each of them possess.

When we wish to fabricate an obturator, we should first take a correct impression in wax of the parts to which it is to be applied. A plaster model is then obtained from the wax impression, and the plate of which the obturators is to be formed correctly, should be adjusted to this mould.

The plates may be of silver, gold or platina, the latter is preferable as it is more lasting.

#### *Obturators sustained by Sponge.*

Obturators of this kind were first described by Ambrose Paré, they are composed of a plate the form and size of which correspond to the opening in the palatine arch. Upon the convex side of the plate are soldered two small pieces of metal, several lines long, separated from each other, and which approach at their extremities. Between these two metallic pivots is placed a piece of fine sponge, which is secured in position by the elasticity of the pivots. The sponge should be very dry, and its size should be in proportion to the opening in the roof of the mouth; when the sponge is introduced into the opening, and there it swells and retains the plate firmly against the palatine arch.

The only change that has been made in obturators sustained by sponge is, that, in some cases, the sponge is attached to the plate by means of ligatures passing through holes made in the middle of the plate, and in others, it is pierced by a screw with a cup attached to the end of it; this method is much the safest plan of confining the sponge to the plate.

These obturators are subject to great inconveniences; they are rarely retained in their place with the force required; the mucous which is soaked up by the sponge, does not fail to undergo a decomposition, which constantly produces a bad smell in the nose and mouth, and it may even excoriate the edges of the opening in the palatine roof, upon which the sponge rests. It is necessary to remove the obturator often, in order that it may be cleaned, and it is well known that to dislodge it, requires some force, which bruises, and even tears the borders of the opening. These different objections were so great as to cause the use of these kinds of obturators to be abandoned.

*Obturators attached to the Teeth.*

Bourdet thought that openings in the palatine arch, resulting from the various constitutional affections would, in time, close; hence he preferred the use of such obturators as were applied against the roof of the mouth, without any portion entering into the opening. It is certain that during the process of cicatrisation, we may expect a contraction of the opening, but when once that process is accomplished, the opening will remain stationary.

The borders of the opening is sometimes very long in cicatrising, either in consequence of new spiculæ of bone, which are yet to be exfoliated, or on account of feebleness of the patient; it is also very probable that the constant passage of air and aliment through it, very much retards the cure of the ulcer. Hence a gold, or platina plate, placed over the opening, will answer the purpose of an obturator, and will facilitate the progress of cicatrisation.

Obturators intended to cover the opening, without penetrating into it, are made of plate, having an arm going off from each side, and fastened to the molar teeth by means of clasps.

*Obturators sustained by a Spring.*

Obturators sustained by a spring, come next to those sustained by sponge, in point of simplicity. They consist of a platina plate, having, upon its convex side, a spring with two branches. When the obturator is to be placed in the mouth, the two branches of the spring are brought together with a pair of pincers, in order to introduce them into the opening in the palatine arch; when they are inserted, they branch off from one another, and rest upon the edges of the opening, and in this manner retain the plate in its position.

These obturators present greater inconveniences than those which are sustained by a sponge; the springs rest obliquely upon two points of the borders of the opening, and press upon them; the obturator, moreover, cannot be removed without using some force, which always bruises the parts, and sometimes lacerates them. All of these objections, notwithstanding its simplicity, are sufficient for us to discard the use of this species of obturator.

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